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THE  
AMERICAN EPHEMERIS  
AND  
NAUTICAL ALMANAC

FOR THE YEAR

1915

PUBLISHED BY THE NAUTICAL ALMANAC OFFICE, U. S.  
NAVAL OBSERVATORY, BY DIRECTION OF THE SECRETARY  
OF THE NAVY AND UNDER THE AUTHORITY OF CONGRESS.  
SOLD BY THE SUPERINTENDENT OF DOCUMENTS,  
GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

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# ERRATA.

## *The American Ephemeris, 1912.*

Page.			
240,	Footnote, $\delta^2$ Cham. . . . .	for 256'' s.	read 256'' n.
247,	Footnote, $\alpha$ Cygni . . . . .	for f. 1'	read f. 1 <sup>a</sup>
560,	Second eclipse, Moon's declination . . . . .	for 11 0 47.9 N.	read 11 0 53.1 N.
636,	Synodic Period, Satellite IX . . . . .	for 580 4.7	read 523 15.6
650,	Bogota, Red. to Geoc. Lat. . . . .	for -11 51.5	read -1 51.5
654,	Lawrence, Geographic Latitude . . . . .	for +36°	read +38°
657,	San Fernando, Long. from Greenwich . . . . .	for +6 27 18.0	read +6 12 18.0
For other errata, 1912, see page iv of <i>The American Ephemeris</i> , 1913 and 1914.			

## *The American Ephemeris, 1913.*

240,	Footnote, $\delta^2$ Cham. . . . .	for 256'' s.	read 256'' n.
247,	Footnote, $\alpha$ Cygni . . . . .	for f. 1'	read f. 1 <sup>a</sup>
572,	Second star . . . . .	for $\nu$ Geminorum	read $\nu$ Geminorum
	Tenth star . . . . .	for $\nu^1$ Cancrī	read $\nu^1$ Cancrī
	Eleventh star . . . . .	for $\nu^2$ Cancrī	read $\nu^2$ Cancrī
657,	Synodic Period, Satellite IX . . . . .	for 580 2.9	read 523 15.6
670,	Bogota, Red. to Geoc. Lat. . . . .	for -11 51.5	read -1 51.5
674,	Lawrence, Kans., Geographic Lat. . . . .	for +36°	read +38°
677,	San Fernando, Long. from Greenwich . . . . .	for +6 27 18.0	read +6 12 18.0
For other errata, 1913, see page iv of <i>The American Ephemeris</i> , 1914.			

## *The American Ephemeris, 1914.*

137,	Dec. 32, Upper Transit, Diff. for 1 Hr. . . . .	for 2.20	read 2.21
240,	Footnote, $\delta^2$ Cham. . . . .	for 256'' s.	read 256'' n.
247,	Footnote, $\alpha$ Cygni . . . . .	for f. 1'	read f. 1 <sup>a</sup>
526,	Jan. 21 U, Bright Limbs . . . . .	for N.	read N.
549,	Dec. 31, Apparent Declination . . . . .	for 47.4	read 47.5
558,	Dec. 32, Apparent Declination . . . . .	for 2.3	read 2.4
657,	Synodic Period, Satellite IX . . . . .	for 580 2.9	read 523 15.6
669,	Dec. 23 12 — . . . . .	for $\odot$	read $\odot$
670,	Bogota, Red. to Geoc. Lat. . . . .	for -11 51.5	read -1 51.5
674,	Lawrence, Kans., Geographic Lat. . . . .	for +36°	read +38°
677,	San Fernando, Long. from Greenwich . . . . .	for +6 27 18.0	read +6 12 18.0



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# ANNIVERSARIES AND FESTIVALS, 1915.

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New Year's Day . . . . .	Friday, Jan. 1.
Epiphany . . . . .	Wednesday, Jan. 6.
Septuagesima Sunday . . . . .	Sunday, Jan. 31.
Lincoln's Birthday . . . . .	Friday, Feb. 12.
Quinquagesima (Shrove Sunday) . . . . .	Sunday, Feb. 14.
Ash Wednesday . . . . .	Wednesday, Feb. 17.
Washington's Birthday . . . . .	Monday, Feb. 22.
Palm Sunday . . . . .	Sunday, Mar. 28.
First Day of Passover . . . . .	Tuesday, Mar. 30.
Good Friday . . . . .	Friday, Apr. 2.
Easter Sunday . . . . .	Sunday, Apr. 4.
Rogation Sunday . . . . .	Sunday, May 9.
Ascension Day (Holy Thursday) . . . . .	Thursday, May 13.
Hebrew Pentecost (Shebuoth) . . . . .	Wednesday, May 19.
Pentecost (Whit Sunday) . . . . .	Sunday, May 23.
Memorial Day . . . . .	Sunday, May 30.
Trinity Sunday . . . . .	Sunday, May 30.
Corpus Christi . . . . .	Thursday, June 3.
Independence Day . . . . .	Sunday, July 4.
Labor Day (except in certain States) . . . . .	Monday, Sept. 6.
Day of Atonement (Yom Kippur) . . . . .	Saturday, Sept. 18.
First Day of Tabernacle (Sucoth) . . . . .	Thursday, Sept. 23.
Election Day (in some States) . . . . .	Tuesday, Nov. 2.
Thanksgiving Day . . . . .	Thursday, Nov. 25.
First Sunday in Advent . . . . .	Sunday, Nov. 28.
Christmas Day . . . . .	Saturday, Dec. 25.

# INTRODUCTION.

---

The Ephemeris for the Meridian of Greenwich, comprising Part I of this volume, has been constructed from various tables of the Sun, Moon, and planets, as stated below, and the ephemerides of these bodies for the meridian of Washington contained in Part II have been computed from the same tables.

The Ephemeris of the Sun is constructed from NEWCOMB'S *Tables of the Sun, Astronomical Papers of the American Ephemeris*, Vol. VI, part 1.

The adopted value of the mean equatorial horizontal parallax of the Sun is 8''.80, *Paris Conference, May, 1896*.

The Sun's rectangular equatorial coordinates are computed from the longitudes and latitudes by the following formulæ:

$$\begin{aligned} X &= R \cos \lambda \\ Y &= R \sin \lambda \cos \omega - 19.3 R \beta \\ Z &= R \sin \lambda \sin \omega + 44.5 R \beta \end{aligned}$$

The reductions to mean equinox are computed by the formulæ—

$$\begin{aligned} \Delta X &= +Y \sec \omega \Delta \lambda \sin 1'' \\ \Delta Y &= -X \cos \omega \Delta \lambda \sin 1'' + Z \Delta \omega \sin 1'' + 9.1 \tau R \sin (\lambda + 6^\circ) \\ \Delta Z &= -X \sin \omega \Delta \lambda \sin 1'' - Y \Delta \omega \sin 1'' - 21.0 \tau R \sin (\lambda + 6^\circ) \end{aligned}$$

where the numerical coefficients are in units of the seventh place of decimals and

$R$  = the Sun's radius vector,

$\lambda$  = the Sun's true longitude,

$\beta$  = the Sun's true latitude, expressed in seconds of arc,

$\omega$  = the obliquity of the ecliptic,

$\Delta \lambda$  = the reduction of longitude for precession and nutation from the beginning of the Besselian fictitious year,

$\Delta \omega$  = the reduction of the mean to the apparent obliquity,

$\tau$  = the fraction of the year since the beginning of the Besselian fictitious year.

The longitude, latitude, and parallax of the Moon are derived from HANSEN'S *Tables de la Lune* (London, 1857), the mean longitude being corrected as in previous years, beginning with the volume for the year 1883. The statement concerning these corrections which is contained in the volumes from 1883 to 1911, inclusive, is erroneous, in that they have not been computed strictly in accordance with the formula in NEWCOMB'S *Researches on the Motion of the Moon*, part 1, page 268, *Washington Observations*, 1875, Appendix II. That formula is,

$$-1''.14 - 29''.17 T - 3''.86 T^2 - V_2 - 0''.09 \sin A - 15''.49 \cos A,$$

while the expression actually used is,

$$-1''.14 - 29''.17 T - 3''.76 T^2 - V_2 - 15''.49 \cos A.$$

In these formulæ  $T$  is the time in units of 100 years reckoned from 1800.

The ephemerides of Mercury, Venus, and Mars are derived from NEWCOMB'S tables of these planets, *Astronomical Papers of the American Ephemeris*, Vol. VI, parts 2, 3, and 4.

The ephemerides of Jupiter and Saturn are derived from the tables constructed in this office by GEORGE W. HILL, *Astronomical Papers of the American Ephemeris*, Vol. VII, parts 1 and 2.

The ephemerides of Uranus and Neptune are derived from NEWCOMB'S tables of these planets, *Astronomical Papers of the American Ephemeris*, Vol. VII, parts 3 and 4.

The nutation used in computing the ephemerides of the Sun, Moon, and planets has been taken from Tables XXXII and XXXIII of NEWCOMB'S Tables of the Sun, *Astronomical Papers of the American Ephemeris*, Vol. VI, part 1, and is given at intervals of five days on page 214. The formulæ from which the nutation is computed are as follows, the time interval  $T$  being expressed in units of 100 years, reckoned from 1900. See *Tables of the Sun*, page 26.

$$\begin{aligned}\delta\psi &= -(17''.234 + 0''.017 T) \sin \Omega \\ &+ 0''.209 \sin 2 \Omega \\ &- 1''.257 \sin 2 L \\ &- 0''.049 \sin (3 L + 78^\circ.7) \\ &+ 0''.110 \sin (L + 75^\circ.3) \\ \delta\varepsilon &= +9''.214 \cos \Omega \\ &- 0''.090 \cos 2 \Omega \\ &+ 0''.546 \cos 2 L \\ &+ 0''.021 \cos (3 L + 78^\circ.7) \\ &- 0''.009 \cos (L - 78^\circ.7)\end{aligned}$$

The formulæ for the nutation used in computing the Besselian and Independent Star Numbers, pages 218–229, are as follows:

Terms of Long Period.	Terms of Short Period.
$\delta\psi = -(17''.234 + 0''.017 T) \sin \Omega$	$-0''.204 \sin 2 \mathcal{C}$
$+ 0''.209 \sin 2 \Omega$	$+ 0''.011 \sin (\mathcal{C} + \Gamma')$
$- 1''.272 \sin 2 L$	$+ 0''.068 \sin (\mathcal{C} - \Gamma')$
$+ 0''.126 \sin (L - \Gamma)$	$- 0''.034 \sin (2 \mathcal{C} - \Omega)$
$- 0''.050 \sin (3 L - \Gamma)$	$- 0''.026 \sin (3 \mathcal{C} - \Gamma')$
$+ 0''.021 \sin (L + \Gamma)$	$+ 0''.015 \sin (\mathcal{C} - 2 L + \Gamma')$
$+ 0''.012 \sin (2 L - \Omega)$	$+ 0''.006 \sin 2 (\mathcal{C} - L)$
$\delta\varepsilon = + (9''.210 + 0''.0009 T) \cos \Omega$	$+ 0''.088 \cos 2 \mathcal{C}$
$- 0''.090 \cos 2 \Omega$	$+ 0''.018 \cos (2 \mathcal{C} - \Omega)$
$+ 0''.552 \cos 2 L$	$+ 0''.011 \cos (3 \mathcal{C} - \Gamma')$
$+ 0''.022 \cos (3 L - \Gamma)$	$- 0''.005 \cos (\mathcal{C} + \Gamma')$
$- 0''.009 \cos (L + \Gamma)$	
$- 0''.007 \cos (2 L - \Omega)$	

The meaning of the symbols used and the manner in which these latter formulæ have been employed in computing the ephemerides of the stars, pages 251 to 510, are explained on pages 216 and 217. The slight discrepancy between the terms in  $2 L$  in these two sets of formulæ is due to the correction of an error in the first set. See *Bulletin Astronomique*, 1898, Vol. XV, page 244.

The list of 825 stars contained in Part II has been selected from NEWCOMB'S Catalogue of Fundamental Stars, *Astronomical Papers of the American Ephemeris*, Vol. VIII, part 2. The mean places and annual variations of the stars have been taken from NEWCOMB'S Catalogue, except that those of  $\epsilon$  Hydri, 38 Horologii (G.), and  $\pi$  Centauri have been taken from *Veroeffentlichungen des Koeniglichen Astronomischen Rechen-Instituts zu Berlin*, 1907, No. 33.

The relative accuracy with which the places of the stars are determined in both right ascension and declination may be estimated approximately from the mean errors for the year 1920, given on pages 511–517, and taken from *Astronomical Papers of the American Ephemeris*, Vol. VIII, part 2, pages 370–382.

The constants of aberration, precession, nutation, and obliquity of the ecliptic, used in the reduction of stars to apparent place, are given on pages 213 and 214, and the formulæ for the computation of the Besselian and Independent Star Numbers are given on page 216, the coefficients being those given by NEWCOMB in *Bulletin Astronomique*, 1898, Vol. XV, page 241.

The terms of short period of the nutation depending on the Moon's mean longitude are tabulated for Washington mean midnight of each day on pages 231–232, and have been computed from the formulæ for these terms given above.

The method by which the right ascensions and declinations of the stars interpolated from the 10-day ephemerides (pp. 287-486) are corrected for the effect of these short-period terms is given on page 217.

According to the formulæ on pages 216 and 217 the star constants  $a, b, c, d, a', b', c', d'$  are computed for each star from its mean place at the beginning of the year, but if strict accuracy is required they should be computed from the star's mean place at date, and the following second-order terms should be added to the usual expressions for the reduction from mean to apparent place, namely—

To $\alpha - \alpha_0$	To $\delta - \delta_0$
$\begin{aligned} &+0.000\ 003\ r^2\ \sin\ \alpha \} \tan\ \delta \\ &-0.000\ 149\ r^2\ \cos\ \alpha \} \\ &-0.000\ 0650\ r^2\ \sin\ 2\alpha \} \\ &+0.000\ 0103\ \sin\ 2\ \odot\ \cos\ 2\alpha \} \tan^2\ \delta \\ &-0.000\ 0107\ \cos\ 2\ \odot\ \sin\ 2\alpha \} \\ &+0.000\ 0620\ \sin\ 2\ \odot\ \cos\ 2\alpha \} \sec^2\ \delta \\ &-0.000\ 0622\ \cos\ 2\ \odot\ \sin\ 2\alpha \} \\ &+0.000\ 0513\ \sin\ (\odot + \odot_0)\ \cos\ 2\alpha \} \\ &-0.000\ 0507\ \cos\ (\odot + \odot_0)\ \sin\ 2\alpha \} \tan\ \delta\ \sec\ \delta \\ &+0.000\ 0097\ \sin\ (\odot - \odot_0)\ \cos\ 2\alpha \} \\ &-0.000\ 0053\ \cos\ (\odot - \odot_0)\ \sin\ 2\alpha \} \end{aligned}$	$\begin{aligned} &+0.000\ 975\ r^2\ \sin^2\ \alpha \\ &-0.000\ 023\ \cos\ 2\ \odot \\ &-0.000\ 080\ \cos\ 2\ \odot\ \cos\ 2\alpha \} \tan\ \delta \\ &-0.000\ 077\ \sin\ 2\ \odot\ \sin\ 2\alpha \} \\ &+0.000\ 040\ \cos\ 2\ \odot \\ &-0.000\ 467\ \cos\ 2\ \odot\ \cos\ 2\alpha \} \\ &-0.000\ 465\ \sin\ 2\ \odot\ \sin\ 2\alpha \} \\ &-0.000\ 039\ \cos\ (\odot + \odot_0) \\ &-0.000\ 380\ \cos\ (\odot + \odot_0)\ \cos\ 2\alpha \} \sin\ \delta\ \tan\ \delta \\ &-0.000\ 385\ \sin\ (\odot + \odot_0)\ \sin\ 2\alpha \} \\ &-0.000\ 380\ \cos\ (\odot - \odot_0) \\ &-0.000\ 040\ \cos\ (\odot - \odot_0)\ \cos\ 2\alpha \} \\ &-0.000\ 072\ \sin\ (\odot - \odot_0)\ \sin\ 2\alpha \} \end{aligned}$

These terms are negligible for stars whose declination is numerically less than  $80^\circ$ , but in computing the apparent places given in the American Ephemeris they have been applied whenever sensible.

The *apparent* places of  $\alpha$  Canis Majoris (Sirius),  $\alpha$  Canis Minoris (Procyon),  $\alpha^2$  Centauri, and 61 Cygni, have been corrected for the effect of annual parallax, the adopted constants of parallax being  $0''.38$ ,  $0''.27$ ,  $0''.75$ , and  $0''.40$ , respectively.

The *apparent* places of  $\alpha$  Canis Majoris (Sirius),  $\alpha$  Canis Minoris (Procyon), and  $\alpha^2$  Centauri, have been corrected for the effect of orbital motion. AUWERS'S elements were used for Sirius and Procyon, and SEE'S elements for  $\alpha^2$  Centauri. The values of these corrections are given on pages 98 and 99 of *Veroeffentlichungen des Koeniglichen Astronomischen Rechen-Instituts zu Berlin*, 1907, No. 33, but those for Sirius and Procyon need an additional correction to refer them to the center of the orbit before they are applicable to the mean places taken from NEWCOMB'S Fundamental Catalogue. These additional corrections for Sirius and Procyon were omitted in the Star List [Supplement to the American Ephemeris and Nautical Almanac] for 1910 and 1911, and in the American Ephemeris and Nautical Almanac for 1912 and 1913. The values of the corrections for the three stars are—

	Sirius.		Procyon.		$\alpha^2$ Centauri.	
	1915.0	1916.0	1915.0	1916.0	1915.0	1916.0
$\Delta\alpha$	$-0''.140$	$-0''.142$	$-0''.061$	$-0''.062$	$+0''.669$	$+0''.658$
$\Delta\delta$	$-0''.32$	$-0''.46$	$-0''.20$	$-0''.08$	$+6''.51$	$+6''.25$

The values of  $\Delta\alpha$  and  $\Delta\delta$  which are given for the companions to the stars  $\gamma$  Andromedæ,  $\zeta$  Ursæ Majoris and 61 Cygni, have been taken from the Greenwich 10-year catalogue for 1890, those for  $\alpha$  Crucis from the Cape Catalogue for 1900, and those for  $\alpha^2$  Geminorum from DOBERCK'S elements given in the *Astronomische Nachrichten*, 1904, Vol. 166, page 145.

The magnitudes of the stars have, with a few exceptions, been taken from *Annals of the Harvard College Observatory*, Vol. L, 1908.

In general, the names of the stars are the same as in NEWCOMB'S Suggested List of Fundamental Stars, except that the FLAMSTEED number has been omitted in all cases where Greek or italic letters are available. In some cases the constellation and number of the uranometries of HEIS or GOULD have been used. In all such cases, Heis or the letter G in parentheses follows the constellation name, as, for example, 5 Cassiopeiæ (Heis) and 38 Horologii (G.).

The stars occulted by the Moon, pages 565-569, have been selected from the catalogue of zodiacal stars contained in Vol. VIII, part 3, *Astronomical Papers of the American Ephemeris*, and the mean places for 1915.0 have been derived from the same catalogue.

In Part III the elements of eclipses of the Sun and occultations of stars by the Moon are given in accordance with BESSEL'S method, the special forms employed being a modification of those developed in CHAUVENET'S *Spherical and Practical Astronomy*.

In the computation of the elements of Eclipses, the following corrections to the longitude, latitude, and parallax of the Moon, deduced by NEWCOMB from recent observations of occultations of stars by the Moon, have been applied. These corrections have been assumed in each case to be constant during the eclipse.

G. M. T.	$\delta v$	$\delta b$	$\delta \pi$
1915.	"	"	"
Feb. 13 <sup>d</sup> 16 <sup>h</sup>	+6.6	-0.4	+0.4
Aug. 10 11	+8.8	+0.4	+0.4

The satellites of Mars are computed from manuscript tables based upon elements deduced by WALTER S. HARSHMAN.

The eclipses of Jupiter's satellites are computed from a *Continuation of DAMOISEAU'S Tables*. The occultations, transits, etc., are computed from WOOLHOUSE'S tables, given in the *British Nautical Almanac* for 1835; Table II of each satellite having been adapted to DAMOISEAU'S tables.

The Vth satellite of Jupiter is computed from manuscript tables based upon unpublished elements deduced from the observations of BARNARD.

The differential coordinates of Jupiter's VIth and VIIth satellites have been computed from elements and tables given in *Lick Observatory Bulletin*, 1906, Vol. IV, No. 112, and in *Astronomische Nachrichten*, 1907, Vol. 174, page 359, respectively.

The elongations and conjunctions of the satellites and the positions of the rings of Saturn are computed from manuscript tables based on elements given by H. STRUVE in *Observations de Poulkova*, Supplement 1, St. Petersburg, 1888; *Publications de Poulkovo*, Second Series, Vol. XI, St. Petersburg, 1898; and *Astronomische Nachrichten*, 1903, Vol. 162, pages 325-344. The differential coordinates of Phœbe have been computed from elements and tables given in the *Annals of Harvard College Observatory*, 1905, Vol. LIII, No. VI.

The apparent dimensions of the rings of Saturn are computed from BESSEL'S data, except those for the dusky ring, which are based on the observations of various astronomers.

The elongations of the satellites of Uranus are computed from the data of NEWCOMB'S *Uranian and Neptunian Systems*, *Washington Observations*, 1873, Appendix I.

The elongations of the satellite of Neptune are computed from manuscript tables based upon elements given by A. HALL in the *Astronomical Journal*, 1898, Vol. XIX, page 65.



The adopted apparent semidiameter of the Sun at the Earth's mean distance is  $16' 1''.50$ ; while in the computation of eclipses the value given by AUWERS in the *Astronomische Nachrichten*, 1891, Vol. 128, page 367, is employed, viz.,  $15' 59''.63$ .

In the computation of the ephemeris for physical observations of the Sun, page 611, the following elements by CARRINGTON have been used:

Inclination of the Sun's equator to the ecliptic	. . . . .	$7^{\circ} 15'$
Longitude of the ascending node of the Sun's equator on the ecliptic	. . . . .	$73^{\circ} 40' + 50''.25 (t - 1850)$
Sidereal period of rotation (mean solar days)	. . . . .	$25^d.38$

The apparent semidiameter of the Moon is computed from the Moon's equatorial horizontal parallax,  $\pi$ , by the formula,

$$S = 0.272\ 506\ \pi + 1''.50$$

where the constant 0.272 506 is based on data from occultations given by J. PETERS in the *Astronomische Nachrichten*, 1895, Vol. 138, page 147; and the constant  $1''.50$  is added to cover the average effect of irradiation.

The value of the Moon's semidiameter employed in the computation of eclipses is computed from the formula,

$$S = 0.272\ 274\ \pi$$

The ephemeris for physical observations of the Moon, pages 612–619, has been computed from formulæ and elements given by F. HAYN in *Abhandlungen der K. Sächsischen Gesell. der Wissenschaften*, Vols. 29 and 30, 1904, 1907.

The notation used for the geocentric librations of the Moon is as follows:

- $I$  = the mean inclination of the Moon's equator to the ecliptic ( $= 1^{\circ} 32'.1$ ),
- $\Omega$  = the mean longitude of the Moon's ascending node, or the mean longitude of the descending node of the Moon's equator,
- $C$  = the angle at the center of the Moon's disk made by a lunar meridian with the circle of declination, counted from north to east on the apparent disk,
- $\lambda, \beta, \alpha, \delta$  = the geocentric longitude, latitude, right ascension, and declination of the Moon,
- $i, \Delta, \Omega', \zeta$  = the quantities defined on page 212, where their values for the current year are given,
- $g'$  = Earth's mean anomaly,
- $g$  = Moon's mean anomaly,
- $\omega$  = Angular distance of Moon's perigee from the ascending node,
- $b, l$  = Optical librations in latitude and longitude, respectively,
- $\delta b, \delta l$  = Physical librations in latitude and longitude, respectively,
- $\delta C$  = Physical libration of  $C$ .

The Moon's geocentric librations in longitude and latitude or, in other words, the earth's selenographic longitude and latitude, are equal to  $l + \delta l$  and  $b + \delta b$ , respectively, and may be found, for any time, by means of the following formulæ, in connection with the tables given on pages 212 and 213:—

$$\begin{aligned} \mu &= -0'.617 \sin 2(\Omega - \lambda) \\ A &= \sin I \cos (\Omega - \lambda) \\ \tan B &= \tan I \sin (\Omega - \lambda) \\ \lambda' &= \lambda + \mu + Ab \\ b &= B - \beta \\ l &= \lambda' - \zeta \\ \sin C &= \sin i \frac{\cos (\lambda' + \Delta - \Omega)}{\cos \delta} = -\sin i \frac{\cos (\alpha - \Omega')}{\cos b} \\ \delta b &= +108'' \sin (\omega + l) + 37'' \sin (\omega - l) - 11'' \sin (g + \omega - l) \\ \delta l &= +12'' \sin g - 59'' \sin g' - 18'' \sin 2\omega \\ &\quad - [108'' \cos (\omega + l) - 37'' \cos (\omega - l) + 11'' \cos (g + \omega - l)] \tan b \\ \delta C &= -[108'' \cos (\omega + l) - 37'' \cos (\omega - l) + 11'' \cos (g + \omega - l)] \sec b \end{aligned}$$



The Sun's selenographic latitude and longitude have been computed from formulæ the same as those given above except that the heliocentric coordinates of the Moon have been substituted for the geocentric coordinates.

The following elements have been used in computing the ephemerides for physical observations of the planets Mars and Jupiter:

Position of north pole of Mars . . . . .	$\left\{ \begin{array}{l} \alpha = 21^{\text{h}} 10^{\text{m}} 0^{\text{s}} + 1^{\text{s}}.565(t-1905) \\ \delta = 54^{\circ} 30' 0'' + 12''.60(t-1905) \end{array} \right.$
Position of north pole of Jupiter . . . . .	$\left\{ \begin{array}{l} \alpha = 17^{\text{h}} 52^{\text{m}} 0^{\text{s}}.84 + 0^{\text{s}}.247(t-1910) \\ \delta = 64^{\circ} 33' 34''.6 - 0''.60(t-1910) \end{array} \right.$
Rotation period of Mars . . . . .	$24^{\text{h}} 37^{\text{m}} 22^{\text{s}}.65$
Rotation period of Jupiter $\left\{ \begin{array}{l} \text{System I.} \\ \text{System II.} \end{array} \right.$ . . . . .	$\left\{ \begin{array}{l} 9^{\text{h}} 50^{\text{m}} 30^{\text{s}}.004 \\ 9^{\text{h}} 55^{\text{m}} 40^{\text{s}}.632 \end{array} \right.$
Longitude of Central Meridian of Mars, May 15, 1897, Greenwich Mean Noon . . . . .	$52^{\circ}.01$
Longitude of Central Meridian of Jupiter (System I.), July 14, 1897, Greenwich Mean Noon . . . . .	$47^{\circ}.31$
Longitude of Central Meridian of Jupiter (System II.), July 14, 1897, Greenwich Mean Noon . . . . .	$96^{\circ}.58$

The position of the north pole of Mars is as given by LOWELL and CROMMELIN (see *Monthly Notices R. A. S.*, 1905, Vol. 66, page 56), while that of the north pole of Jupiter has been deduced from the position given by DAMOISEAU for 1750 (see *Tables Écliptiques des Satellites de Jupiter*, page (1)). The rotation periods of Mars and of Jupiter and the longitudes of the central meridians are according to MARTH (see *Monthly Notices R. A. S.*, 1896, Vol. 56, pages 395-403 and 517-524). The longitude of the Great Red Spot and the time of its transit across the Central Meridian given in the volumes for 1913 and 1914 are replaced by those of System II. of MARTH. This change has been made in view of the following facts: The Paris Conference of October, 1911, assigned to the office of the American Ephemeris and Nautical Almanac the preparation of the ephemerides for the physical observations of the planets; a general desire exists that the use of System II. of MARTH should not be discontinued; and the position of the Great Red Spot during the opposition of 1912 was about  $70^{\circ}$  from the place predicted from the elements adopted in the American Ephemeris and Nautical Almanac for 1913.

The adopted semidiameters of the planets are given on page xv, and their stellar magnitudes have been computed from formulæ given by G. MUELLER in *Publicationen des Astrophysikalischen Observatoriums zu Potsdam*, 1893, Vol. 8, page 366.

In the list of observatories, pages 670-679, the latitudes given are in most cases astronomical. In some instances they have been determined by geodetic triangulation from other points. The reductions from geographic to geocentric latitude,  $\varphi' - \varphi$ , and the distance from the center of the earth,  $\rho$ , are computed from the formulæ on page xiv, using the flattening  $\frac{1}{297}$  obtained by JOHN F. HAYFORD in *Supplementary Investigation in 1909 of the Figure of the Earth and Isostasy*, U. S. Coast and Geodetic Survey, 1910, and adopted by the *Paris Conference*, October, 1911.

# CHRONOLOGICAL ERAS AND CYCLES.

## CHRONOLOGICAL ERAS.

THE YEAR 1915, WHICH COMPRISES THE LATTER PART OF THE 139TH AND THE BEGINNING OF THE 140TH YEAR OF THE INDEPENDENCE OF THE UNITED STATES OF AMERICA, CORRESPONDS TO—

The year 6628 of the Julian Period;

- “ 7423–7424 of the Byzantine era, the year 7424 commencing on September 1;
- “ 5675–5676 of the Jewish era, the year 5676 commencing on September 9, or, more exactly, at sunset on September 8;
- “ 2668 since the foundation of Rome, according to VARRO;
- “ 2662 since the beginning of the era of NABONASSAR, which has been assigned to Wednesday, the 26th of February of the 3967th year of the Julian Period; corresponding, in the notation of chronologists, to the 747th, and, in the notation of astronomers, to the 746th year before the birth of CHRIST;
- “ 2691 of the Olympiads, or the third year of the 673d Olympiad, commencing in July, 1915, if we fix the era of the Olympiads at  $775\frac{1}{2}$  years before CHRIST, or near the beginning of July of the year 3938 of the Julian Period;
- “ 2227 of the Grecian era, or the era of the SELEUCIDÆ, which began near the vernal equinox of the year,  $-311 = \text{B. C. } 312, = 4402$  of the Julian Period;
- “ 1631 of the era of DIOCLETIAN;
- “ 2575 of the Japanese era and to the 4th year of the period entitled Taisho.

The year 1334 of the Mohammedan era, or the era of the Hegira, begins on the 9th day of November, 1915.

The first day of January of the year 1915 is the 2,420,499th day since the commencement of the Julian Period.

## CHRONOLOGICAL CYCLES.

Dominical Letter . . . . .	C	Solar Cycle . . . . .	20
Epact . . . . .	14	Roman Indiction . . . . .	13
Lunar Cycle or Golden Number	16	Julian Period . . . . .	6628

# ASTRONOMICAL CONSTANTS.

Solar Parallax . . . . .	8.80	} Paris Conference.
Constant of Nutation . . . . .	9.21	
Constant of Aberration . . . . .	20.47	
General Precession . . . . .	$50''.2564 + 0''.000\ 222(t-1900)$	} Newcomb.
Obliquity of the Ecliptic . . . . .	$23^{\circ}\ 27'\ 8''.26 - 0''.4684(t-1900)$	
Equatorial Horizontal Parallax of the Moon . . . . .	$57'\ 2''.63^*$	(Newcomb).
Mean distance Earth to Moon	384 395 kilometers=238 851 miles, or 60.2669 radii.	
Mean distance Earth to Sun	149 499 935 kilometers=92 894 767 statute miles.	
Velocity of light	299 860 kilometers=186 324 statute miles per second (Newcomb and Michelson).	

Light travels unit distance in 498<sup>s</sup>.566.

Gaussian Gravitation Constant,  $\dagger k = 0.017\ 202\ 099 = 3\ 548''.187\ 61$ .

Acceleration in one sec. due to gravity, $g = 9.8060 - 0.0260 \cos 2\varphi - \frac{2h}{R}g.\dagger$	} Helmert.
Length of seconds pendulum, $l = 0.993\ 549 - 0.002\ 631 \cos 2\varphi - \frac{2h}{R}l.\dagger$	

Length of the year:

Tropical (ordinary)	$365.242\ 198\ 79 - 0.000\ 000\ 0614(t-1900)$	} Newcomb.
Sidereal . . . . .	$365.256\ 360\ 42 + 0.000\ 000\ 0011(t-1900)$	
Anomalistic . . . . .	$365.259\ 641\ 34 + 0.000\ 000\ 0304(t-1900)$	
Eclipse . . . . .	$346.620\ 000 + 0.000\ 000\ 36(t-1900)$	

Length of the month:

Synodical (ordinary)	$29.530\ 588 = 29\ 12\ 44\ 2.8$	} Hansen.
Tropical . . . . .	$27.321\ 582 = 27\ 7\ 43\ 4.7$	
Sidereal . . . . .	$27.321\ 661 = 27\ 7\ 43\ 11.5$	
Anomalistic . . . . .	$27.554\ 550 = 27\ 13\ 18\ 33.1$	
Nodical . . . . .	$27.212\ 219 = 27\ 5\ 5\ 35.7$	

Length of the day:

Sidereal . . . . .	$23\ 56\ 4.091$ of mean solar time.
Mean Solar . . . . .	$24\ 3\ 56.555$ of sidereal time.

Dimensions of the Earth (Hayford's Spheroid of 1909):

Equatorial Radius,  $a = 6378.388$  kilometers or 3963.34 statute miles.  
Polar Radius,  $b = 6356.909$  " or 3949.99 " "

Flattening,  $\frac{a-b}{a} = \frac{1}{297.0}$

Logarithm of the eccentricity  $\frac{\sqrt{a^2-b^2}}{a} = \log e = 8.913\ 804$

Logarithm radius =  $\log \rho = 9.999\ 2695 + 0.000\ 7324 \cos 2\varphi - 0.000\ 0019 \cos 4\varphi$ .

Reduction from geographic latitude  $\varphi$  to geocentric latitude  $\varphi'$ ,

$$\varphi' - \varphi = -11'\ 35''.66 \sin 2\varphi + 1''.17 \sin 4\varphi.$$

1 meter = 3.280 8333 feet. 1 foot = 0.304 8006 meters.

1 statute mile = 0.868 392 nautical or geographical miles.

1 nautical mile = 1.151 553 statute miles.

\* Used in the computation of eclipses. The parallax used in the computation of the ephemeris of the Moon contained in this volume is  $57'\ 2''.23$  (Hansen).

$\dagger k^2$  is the acceleration due to the Sun's attraction at the mean distance of the Earth from the Sun, which is also the astronomical unit of distance, the unit of time being one mean solar day.

$\dagger \varphi$  = latitude,  $h$  = elevation above sea level in meters, and  $\log R = 6.80416$ .

NOTE.—The above values of  $\log \rho$  and  $\varphi' - \varphi$  were computed with the eccentricity that results from assuming that the flattening of the earth is exactly  $\frac{1}{297}$ .

# ASTRONOMICAL CONSTANTS.

## SEMIDIAMETERS OF THE SUN, MOON, AND PLANETS.

Name.	At unit Distance. ' "	At mean least Distance. "	In Kilo- meters.	In Statute Miles.	Authority.
Sun . . . . .	15 59.63	. .	695 533.61	432 183.68	Auwers.
Moon . . . . .	15 32.58*	. .	1 737.96	1 079.91	Newcomb.
Mercury . . . . .	3.34	5.45	2 420.82	1 504.24	Le Verrier.
Venus . . . . .	8.55	30.90	6 197.01	3 850.67	Peirce.
Mars . . . . .	5.05	9.64	3 660.22	2 274.37	Peirce.
Jupiter (Equatorial) . . .	1 40.20	23.84	72 624.56	45 127.16	Am. Eph.
Jupiter (Polar) . . . . .	1 34.12	22.40	68 217.80	42 388.90	Peirce.
Saturn (Equatorial) . . .	1 24.88	9.94	61 520.69	38 227.48	Barnard.
Saturn (Polar) . . . . .	1 17.47	9.07	56 149.95	34 890.23	Barnard.
Uranus . . . . .	33.52	1.84	24 295.16	15 096.43	Am. Eph.
Neptune . . . . .	38.66	1.33	28 020.61	17 411.34	Am. Eph.

## ELEMENTS OF THE PLANETARY ORBITS FOR THE EPOCH 1915—January 0<sup>d</sup> G. M. T.

Name.	Mean Dis- tance.	Sidereal Period in Tropical Years.	Sidereal mean daily Motion. "	Synodic Period in Tropical Years.	Eccen- tricity.
☿ Mercury . . . . .	0.387 099	0.240 85	14 732.420	0.317 26	0.205 6173
♀ Venus . . . . .	0.723 331	0.615 21	5 767.670	1.598 72	0.006 8135
⊕ Earth . . . . .	1.000 000	1.000 04	3 548.193	. . .	0.016 7448
♂ Mars . . . . .	1.523 688	1.880 89	1 886.519	2.135 39	0.093 3225
♃ Jupiter . . . . .	5.202 803	11.862 23	299.128	1.092 11	0.048 3620
♄ Saturn . . . . .	9.538 843	29.457 72	120.455	1.035 18	0.055 8379
♅ Uranus . . . . .	19.190 978	84.015 29	42.23	1.012 09	0.047 0865
♆ Neptune . . . . .	30.070 672	164.788 29	21.53	1.006 14	0.008 5428

Name.	Inclina- tion to the Ecliptic. ° ' "	Mean Longi- tude of the Node. ° ' "	Mean Longi- tude of the Perihelion. ° ' "	Mean Longi- tude at the Epoch. ° ' "	Logarithm of Mass in Unit of Sun's Mass.
☿ Mercury . . . . .	7 0 11.4	47 19 25.3	76 7 58.8	276 13 13.51	3.221 8487—10
♀ Venus . . . . .	3 23 37.6	75 54 52.6	130 22 30.0	119 26 49.99	4.389 3398—10
⊕ Earth . . . . .	. . .	. . .	101 28 43.3	99 4 22.04	4.482 2896—10
♂ Mars . . . . .	1 51 1.0	48 54 5.8	334 29 40.4	284 36 34.04	3.509 5499—10
♃ Jupiter . . . . .	1 18 28.5	99 35 22.4	12 57 11.8	333 25 58.17	6.979 9082—10
♄ Saturn . . . . .	2 29 30.1	112 54 51.8	91 22 57.3	90 3 59.41	6.455 7335—10
♅ Uranus . . . . .	0 46 21.9	73 33 56.5	169 17 18.6	307 50 20.14	5.640 7528—10
♆ Neptune . . . . .	1 46 40.1	130 50 37.5	43 53 12.1	118 0 1.18	5.705 5338—10

The elements of the four inner planets are derived from those given by NEWCOMB in Vol. VI of the *Astronomical Papers of the American Ephemeris*, and are the same as those used in computing the ephemerides of these planets. Those of Jupiter, Saturn, Uranus, and Neptune are taken from Vol. VII of the *Astronomical Papers* for the epoch of the tables. They are reduced to 1915 by applying LE VERRIER'S variations, and can not be regarded as being strictly identical with the elements used in computing the ephemerides of those planets in this volume.

\*At mean distance. See Ast. Papers Am. Eph., Vol. IX, p. 39. For the values of the semidiameter used in this volume see page xi.

# SYMBOLS AND ABBREVIATIONS.

## SIGNS OF THE PLANETS, ETC.

☉	The Sun.	♂	Mars.
☾	The Moon.	♃	Jupiter.
☿	Mercury.	♄	Saturn.
♀	Venus.	♅	Uranus.
♁	The Earth.	♆	Neptune.

## SIGNS OF THE ZODIAC.

Spring Signs.	{	1.	♈	Aries.	Autumn Signs.	{	7.	♎	Libra.
		2.	♉	Taurus.			8.	♏	Scorpius.
		3.	♊	Gemini.			9.	♐	Sagittarius.
Summer Signs.	{	4.	♋	Cancer.	Winter Signs.	{	10.	♑	Capricornus.
		5.	♌	Leo.			11.	♒	Aquarius.
		6.	♍	Virgo.			12.	♓	Pisces.

## ASPECTS.

- ♌   Conjunction, or having the same Longitude or Right Ascension.
- ☐   Quadrature, or differing  $\pm 90^\circ$  in Longitude or Right Ascension.
- ♌   Opposition, or differing  $180^\circ$  in Longitude or Right Ascension.

## ABBREVIATIONS.

♈	Ascending Node.	°	Degrees.
♏	Descending Node.	'	Minutes of Arc.
N.	North.	''	Seconds of Arc.
S.	South.	h	Hours.
E.	East.	m	Minutes of Time.
W.	West.	s	Seconds of Time.

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# PART I.

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## ASTRONOMICAL EPHEMERIS FOR THE MERIDIAN OF GREENWICH.

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## AT GREENWICH APPARENT NOON.

**NOTE.**—The mean time of semidiameter passing the meridian may be found by subtracting 0<sup>s</sup>.19 from the sidereal time.

The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing.



AT

MEAN NOON.

Diff. for 1 Hour.	Sidereal Time, or Right Ascen- sion of Mean Sun.		
s	h	m	s
1.189	18	40	13.21
1.175	18	44	9.77
1.161	18	48	6.33
1.146	18	52	2.89
1.130	18	55	59.45
1.112	18	59	56.01
1.094	19	3	52.57
1.075	19	7	49.13
1.054	19	11	45.68
1.032	19	15	42.24
1.010	19	19	38.80
0.986	19	23	35.36
0.961	19	27	31.92
0.935	19	31	28.48
0.908	19	35	25.03
0.880	19	39	21.59
0.851	19	43	18.15
0.821	19	47	14.71
0.790	19	51	11.27
0.759	19	55	7.82
0.727	19	59	4.38
0.695	20	3	0.94
0.662	20	6	57.50
0.629	20	10	54.06
0.595	20	14	50.61
0.561	20	18	47.17
0.527	20	22	43.73
0.493	20	26	40.28
0.459	20	30	36.84
0.425	20	34	33.40
0.391	20	38	29.95
0.357	20	42	26.51

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing.

Diff. for 1 Hour,  
+9°.8565.  
(Table III.)

1915

Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 8.4	15 12.1	55 27.96	+1.126	55 41.69	+1.160	12 30.6	2.21	15.4
2	15 16.0	15 19.9	55 55.75	1.183	56 10.06	1.200	13 22.7	2.13	16.4
3	15 23.8	15 27.8	56 24.52	1.209	56 39.05	1.212	14 12.6	2.03	17.4
4	15 31.7	15 35.7	56 53.60	+1.212	57 8.14	+1.211	15 0.3	1.95	18.4
5	15 39.6	15 43.6	57 22.66	1.208	57 37.13	1.203	15 46.4	1.90	19.4
6	15 47.5	15 51.4	57 51.52	1.195	58 5.79	1.183	16 32.0	1.90	20.4
7	15 55.2	15 59.0	58 19.89	+1.166	58 33.74	+1.140	17 18.3	1.97	21.4
8	16 2.7	16 6.2	58 47.20	1.101	59 0.11	1.048	18 6.8	2.09	22.4
9	16 9.5	16 12.6	59 12.27	0.976	59 23.44	0.882	18 58.9	2.26	23.4
10	16 15.2	16 17.5	59 33.35	+0.764	59 41.68	+0.620	19 55.4	2.45	24.4
11	16 19.3	16 20.4	59 48.12	0.450	59 52.37	+0.255	20 56.4	2.62	25.4
12	16 20.9	16 20.7	59 54.14	+0.037	59 53.18	-0.199	22 0.4	2.69	26.4
13	16 19.6	16 17.7	59 49.32	-0.446	59 42.47	-0.696	23 4.4	2.62	27.4
14	16 15.1	16 11.6	59 32.62	0.944	59 19.86	1.179	0 6	.	28.4
15	16 7.4	16 2.5	59 4.40	1.393	58 46.53	1.580	0 5.4	2.45	29.4
16	15 57.1	15 51.2	58 26.61	-1.734	58 5.07	-1.850	1 1.5	2.23	0.9
17	15 45.0	15 38.6	57 42.38	1.926	57 19.02	1.961	1 52.5	2.02	1.9
18	15 32.2	15 25.9	56 55.49	1.954	56 32.27	1.910	2 39.0	1.87	2.9
19	15 19.8	15 14.0	56 9.80	-1.829	55 48.49	-1.718	3 22.4	1.76	3.9
20	15 8.6	15 3.7	55 28.69	1.578	55 10.72	1.413	4 3.9	1.71	4.9
21	14 59.4	14 55.7	54 54.85	1.229	54 41.28	1.030	4 44.8	1.71	5.9
22	14 52.6	14 50.3	54 30.17	-0.820	54 21.63	-0.603	5 26.3	1.75	6.9
23	14 48.7	14 47.8	54 15.72	-0.382	54 12.47	-0.160	6 9.3	1.84	7.9
24	14 47.6	14 48.2	54 11.88	+0.060	54 13.89	+0.273	6 54.7	1.95	8.9
25	14 49.4	14 51.3	54 18.40	+0.477	54 25.28	+0.668	7 43.0	2.07	9.9
26	14 53.8	14 56.8	54 34.38	0.846	54 45.52	1.007	8 34.0	2.18	10.9
27	15 0.3	15 4.3	54 58.47	1.148	55 12.98	1.266	9 27.2	2.24	11.9
28	15 8.6	15 13.2	55 28.76	+1.360	55 45.54	+1.433	10 21.0	2.24	12.9
29	15 17.9	15 22.8	56 3.04	1.479	56 20.93	1.498	11 14.3	2.19	13.9
30	15 27.7	15 32.5	56 38.88	1.490	56 56.61	1.461	12 5.8	2.10	14.9
31	15 37.2	15 41.7	57 13.85	1.410	57 30.36	1.339	12 55.3	2.02	15.9
32	15 46.0	15 49.9	57 45.91	+1.250	58 0.31	+1.149	13 43.0	1.95	16.9

## GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

GREENWICH MEAN TIME.

---

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

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THE MOON'S RIGHT ASCENSION AND DECLINATION.



## GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

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THE MOON'S RIGHT ASCENSION AND DECLINATION.

## GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
FRIDAY 29.					SUNDAY 31.				
0	7 21 0.78	2.3028	N. 25 26 9.0	6.657	0	9 8 17.80	2.1580	N. 17 37 37.8	12.517
1	7 23 18.89	2.3008	25 19 25.3	6.798	1	9 10 27.18	2.1548	17 25 3.8	12.615
2	7 25 36.87	2.2986	25 12 33.2	6.938	2	9 12 36.37	2.1515	17 12 24.0	12.712
3	7 27 54.72	2.2963	25 5 32.7	7.078	3	9 14 45.36	2.1483	16 59 38.4	12.807
4	7 30 12.43	2.2940	24 58 23.8	7.217	4	9 16 54.17	2.1452	16 46 47.1	12.902
5	7 32 30.00	2.2916	24 51 6.6	7.356	5	9 19 2.78	2.1420	16 33 50.2	12.994
6	7 34 47.42	2.2892	24 43 41.1	7.493	6	9 21 11.21	2.1389	16 20 47.8	13.086
7	7 37 4.70	2.2868	24 36 7.4	7.630	7	9 23 19.45	2.1358	16 7 39.9	13.177
8	7 39 21.83	2.2842	24 28 25.5	7.767	8	9 25 27.50	2.1328	15 54 26.6	13.266
9	7 41 38.80	2.2815	24 20 35.4	7.902	9	9 27 35.38	2.1298	15 41 8.0	13.354
10	7 43 55.61	2.2789	24 12 37.2	8.037	10	9 29 43.07	2.1267	15 27 44.1	13.442
11	7 46 12.27	2.2763	24 4 30.9	8.172	11	9 31 50.58	2.1237	15 14 15.0	13.527
12	7 48 28.76	2.2735	23 56 16.5	8.307	12	9 33 57.91	2.1208	15 0 40.8	13.612
13	7 50 45.09	2.2707	23 47 54.1	8.439	13	9 36 5.07	2.1179	14 47 1.6	13.695
14	7 53 1.24	2.2678	23 39 23.8	8.571	14	9 38 12.06	2.1150	14 33 17.4	13.777
15	7 55 17.22	2.2649	23 30 45.6	8.702	15	9 40 18.87	2.1122	14 19 28.3	13.858
16	7 57 33.03	2.2620	23 21 59.5	8.833	16	9 42 25.52	2.1094	14 5 34.4	13.937
17	7 59 48.66	2.2590	23 13 5.6	8.963	17	9 44 32.00	2.1066	13 51 35.8	14.016
18	8 2 4.11	2.2561	23 4 3.9	9.092	18	9 46 38.31	2.1039	13 37 32.5	14.093
19	8 4 19.39	2.2531	22 54 54.5	9.220	19	9 48 44.47	2.1013	13 23 24.6	14.169
20	8 6 34.48	2.2499	22 45 37.5	9.347	20	9 50 50.47	2.0987	13 9 12.2	14.243
21	8 8 49.38	2.2468	22 36 12.8	9.474	21	9 52 56.31	2.0961	12 54 55.4	14.317
22	8 11 4.10	2.2438	22 26 40.6	9.599	22	9 55 2.00	2.0936	12 40 34.2	14.389
23	8 13 18.63	2.2406	N. 22 17 0.9	9.724	23	9 57 7.54	2.0911	N. 12 26 8.7	14.460
SATURDAY 30.					MONDAY, FEBRUARY 1.				
0	8 15 32.97	2.2374	N. 22 7 13.7	9.848	0	9 59 12.93	2.0887	N. 12 11 39.0	14.529
1	8 17 47.12	2.2342	21 57 19.1	9.971	PHASES OF THE MOON.				
2	8 20 1.07	2.2309	21 47 17.2	10.092					
3	8 22 14.83	2.2277	21 37 8.0	10.213					
4	8 24 28.39	2.2244	21 26 51.6	10.333					
5	8 26 41.76	2.2212	21 16 28.0	10.452	<div><div>○ Full Moon</div><div>☾ Last Quarter</div><div>● New Moon</div><div>☾ First Quarter</div><div>○ Full Moon</div></div> <div><div>d h m</div><div>Jan. 1 0 20.5</div><div>8 9 12.6</div><div>15 2 41.9</div><div>22 17 32.3</div><div>30 16 41.3</div></div>				
6	8 28 54.93	2.2179	21 5 57.3	10.571					
7	8 31 7.91	2.2146	20 55 19.5	10.688					
8	8 33 20.68	2.2112	20 44 34.7	10.804					
9	8 35 33.25	2.2078	20 33 43.0	10.919	<div><div>☾ Perigee</div><div>☾ Apogee</div></div> <div><div>d h</div><div>Jan. 12 2.1</div><div>23 20.7</div></div>				
10	8 37 45.62	2.2046	20 22 44.4	11.033					
11	8 39 57.80	2.2013	20 11 39.0	11.146					
12	8 42 9.77	2.1978	20 0 26.9	11.258					
13	8 44 21.54	2.1945	19 49 8.0	11.369					
14	8 46 33.11	2.1911	19 37 42.6	11.478					
15	8 48 44.47	2.1878	19 26 10.6	11.587					
16	8 50 55.64	2.1845	19 14 32.1	11.696					
17	8 53 6.61	2.1811	19 2 47.1	11.802					
18	8 55 17.37	2.1778	18 50 55.8	11.907					
19	8 57 27.94	2.1745	18 38 58.2	12.012					
20	8 59 38.31	2.1712	18 26 54.3	12.116					
21	9 1 48.48	2.1678	18 14 44.3	12.218					
22	9 3 58.45	2.1645	18 2 28.1	12.320					
23	9 6 8.22	2.1613	17 50 5.9	12.419					
24	9 8 17.80	2.1580	N. 17 37 37.8	12.517					

AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Added to Apparent Time.	Diff. for 1 Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.			
		h m s	s	° ' "	"	' "	s	m s	s
Mon.	1	20 56 7.44	10.214	S. 17 19 22.7	+42.09	16 15.76	68.33	13 38.69	0.357
Tues.	2	21 0 12.17	10.180	17 2 23.3	42.85	16 15.61	68.22	13 46.84	0.323
Wed.	3	21 4 16.08	10.146	16 45 5.9	43.59	16 15.46	68.10	13 54.18	0.289
Thur.	4	21 8 19.19	10.113	16 27 31.0	+44.31	16 15.30	67.99	14 0.71	0.256
Fri.	5	21 12 21.49	10.079	16 9 38.8	45.02	16 15.14	67.87	14 6.44	0.223
Sat.	6	21 16 22.99	10.046	15 51 29.9	45.72	16 14.97	67.75	14 11.37	0.190
SUN.	7	21 20 23.71	10.013	15 33 4.5	+46.40	16 14.80	67.64	14 15.52	0.157
Mon.	8	21 24 23.64	9.981	15 14 23.1	47.05	16 14.62	67.52	14 18.88	0.124
Tues.	9	21 28 22.78	9.948	14 55 26.1	47.69	16 14.44	67.41	14 21.46	0.092
Wed.	10	21 32 21.14	9.916	14 36 14.0	+48.31	16 14.26	67.30	14 23.26	0.060
Thur.	11	21 36 18.74	9.884	14 16 47.1	48.91	16 14.07	67.19	14 24.30	0.028
Fri.	12	21 40 15.56	9.852	13 57 5.9	49.50	16 13.88	67.08	14 24.57	0.004
Sat.	13	21 44 11.63	9.820	13 37 10.9	+50.07	16 13.69	66.97	14 24.08	0.036
SUN.	14	21 48 6.94	9.789	13 17 2.4	50.62	16 13.50	66.86	14 22.84	0.067
Mon.	15	21 52 1.50	9.758	12 56 41.0	51.15	16 13.31	66.76	14 20.84	0.098
Tues.	16	21 55 55.31	9.727	12 36 7.1	+51.66	16 13.12	66.65	14 18.11	0.129
Wed.	17	21 59 48.39	9.697	12 15 21.1	52.16	16 12.92	66.55	14 14.64	0.159
Thur.	18	22 3 40.74	9.667	11 54 23.5	52.64	16 12.71	66.45	14 10.46	0.189
Fri.	19	22 7 32.38	9.637	11 33 14.6	+53.10	16 12.50	66.35	14 5.55	0.218
Sat.	20	22 11 23.33	9.608	11 11 55.0	53.54	16 12.29	66.25	13 59.96	0.247
SUN.	21	22 15 13.58	9.580	10 50 25.0	53.96	16 12.08	66.15	13 53.67	0.275
Mon.	22	22 19 3.16	9.552	10 28 45.1	+54.36	16 11.87	66.06	13 46.72	0.303
Tues.	23	22 22 52.08	9.525	10 6 55.7	54.75	16 11.66	65.97	13 39.10	0.330
Wed.	24	22 26 40.36	9.499	9 44 57.1	55.12	16 11.44	65.88	13 30.85	0.356
Thur.	25	22 30 28.01	9.473	9 22 49.8	+55.48	16 11.21	65.79	13 21.98	0.382
Fri.	26	22 34 15.06	9.448	9 0 34.2	55.82	16 10.99	65.71	13 12.49	0.407
Sat.	27	22 38 1.52	9.424	8 38 10.7	56.14	16 10.76	65.63	13 2.42	0.431
SUN.	28	22 41 47.40	9.401	8 15 39.5	56.45	16 10.53	65.55	12 51.79	0.454
Mon.	29	22 45 32.75	9.379	S. 7 53 1.2	+56.74	16 10.29	65.47	12 40.60	0.476

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0'.19 from the sidereal time.  
The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing.

AT GREENWICH MEAN NOON.



GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 46.0	15 49.9	57 45.91	+1.250	58 0.31	+1.149	13 43.0	1.95	16.9
2	15 53.5	15 56.7	58 13.45	1.040	58 25.26	0.928	14 29.6	1.94	17.9
3	15 59.5	16 2.0	58 35.71	0.814	58 44.79	0.700	15 16.4	1.97	18.9
4	16 4.1	16 5.9	58 52.52	+0.589	58 58.95	+0.484	16 4.5	2.05	19.9
5	16 7.3	16 8.4	59 4.15	0.383	59 8.16	0.286	16 55.3	2.19	20.9
6	16 9.2	16 9.6	59 11.02	0.192	59 12.77	+0.101	17 49.7	2.35	21.9
7	16 9.8	16 9.7	59 13.44	+0.010	59 13.00	−0.084	18 48.0	2.50	22.9
8	16 9.3	16 8.5	59 11.41	−0.182	59 8.62	0.285	19 49.4	2.59	23.9
9	16 7.4	16 5.9	59 4.55	0.395	58 59.12	0.512	20 51.7	2.58	24.9
10	16 4.0	16 1.8	58 52.25	−0.635	58 43.87	−0.762	21 52.3	2.45	25.9
11	15 59.1	15 55.9	58 33.95	0.891	58 22.49	1.018	22 49.2	2.28	26.9
12	15 52.4	15 48.5	58 9.53	1.140	57 55.16	1.253	23 41.6	2.09	27.9
13	15 44.2	15 39.7	57 39.51	−1.353	57 22.76	−1.435	0	.	28.9
14	15 34.9	15 29.9	57 5.16	1.495	56 46.97	1.533	0 29.7	1.92	0.3
15	15 24.9	15 19.8	56 28.48	1.545	56 10.01	1.529	1 14.5	1.81	1.3
16	15 14.9	15 10.1	55 51.89	−1.486	55 34.45	−1.416	1 57.1	1.75	2.3
17	15 5.7	15 1.6	55 18.01	1.320	55 2.86	1.202	2 38.7	1.72	3.3
18	14 57.8	14 54.6	54 49.26	1.061	54 37.48	0.899	3 20.3	1.75	4.3
19	14 52.0	14 50.0	54 27.76	−0.718	54 20.30	−0.523	4 3.0	1.81	5.3
20	14 48.6	14 47.9	54 15.23	−0.319	54 12.67	−0.106	4 47.5	1.90	6.3
21	14 47.9	14 48.6	54 12.70	+0.112	54 15.38	+0.335	5 34.5	2.01	7.3
22	14 50.1	14 52.2	54 20.73	+0.556	54 28.70	+0.772	6 24.1	2.12	8.3
23	14 55.1	14 58.6	54 39.22	0.980	54 52.18	1.177	7 15.9	2.19	9.3
24	15 2.8	15 7.5	55 7.41	1.358	55 24.70	1.520	8 9.0	2.22	10.3
5	15 12.7	15 18.3	55 43.79	+1.658	56 4.38	+1.769	9 2.2	2.21	11.3
6	15 24.2	15 30.4	56 26.13	1.850	56 48.64	1.896	9 54.4	2.14	12.3
7	15 36.6	15 42.8	57 11.48	1.905	57 34.21	1.876	10 44.9	2.08	13.3
8	15 48.8	15 54.6	57 56.35	1.807	58 17.44	1.702	11 34.0	2.02	14.3
9	15 59.9	16 4.7	58 37.05	+1.561	58 54.78	+1.388	12 22.0	1.99	15.3



MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

G

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

 MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

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AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

## PHASES OF THE MOON.

								d	h	m
☾	Last Quarter	.	.	.	.	.	Feb.	6	17	10.9
●	New Moon	.	.	.	.	.	.	13	16	31.0
☾	First Quarter	.	.	.	.	.	.	21	14	58.3

☾ Perigee	.	.	.	.	.	.	.	.	Feb.	d 7	h 1.3
☾ ' Apogee	.	.	.	.	.	.	.	.	.	20	17.9



AT GREENWICH APPARENT NOON.

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting  $0^{\text{h}}.10$  from the sidereal time.

The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing; north declinations increasing.

AT GREENWICH MEAN NOON.

Day of the Week.	Day of the Month.	THE SUN'S				Equation of Time, to be Subtracted from Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
		h m s	s	° ' "	"	m s	s	h m s
Mon.	1	22 45 30.76	9.380	S. 7 53 13.2	+56.74	12 40.70	0.476	22 32 50.06
Tues.	2	22 49 15.61	9.358	7 30 27.9	57.02	12 29.00	0.498	22 36 46.61
Wed.	3	22 52 59.96	9.338	7 7 36.2	57.28	12 16.80	0.519	22 40 43.17
Thur.	4	22 56 43.83	9.318	6 44 38.4	+57.53	12 4.11	0.539	22 44 39.72
Fri.	5	23 0 27.24	9.300	6 21 34.7	57.76	11 50.97	0.557	22 48 36.28
Sat.	6	23 4 10.22	9.282	5 58 25.7	57.98	11 37.39	0.574	22 52 32.83
SUN.	7	23 7 52.78	9.265	5 35 11.7	+58.18	11 23.40	0.591	22 56 29.38
Mon.	8	23 11 34.96	9.249	5 11 53.0	58.37	11 9.02	0.607	23 0 25.94
Tues.	9	23 15 16.76	9.234	4 48 30.1	58.54	10 54.26	0.622	23 4 22.49
Wed.	10	23 18 58.20	9.220	4 25 3.3	+58.69	10 39.15	0.636	23 8 19.04
Thur.	11	23 22 39.31	9.206	4 1 33.0	58.83	10 23.71	0.650	23 12 15.60
Fri.	12	23 26 20.10	9.193	3 37 59.6	58.95	10 7.95	0.663	23 16 12.15
Sat.	13	23 30 0.59	9.181	3 14 23.6	+59.05	9 51.88	0.675	23 20 8.70
SUN.	14	23 33 40.80	9.170	2 50 45.3	59.14	9 35.54	0.686	23 24 5.26
Mon.	15	23 37 20.74	9.159	2 27 5.2	59.21	9 18.93	0.697	23 28 1.81
Tues.	16	23 41 0.43	9.149	2 3 23.5	+59.26	9 2.07	0.707	23 31 58.37
Wed.	17	23 44 39.89	9.140	1 39 40.8	59.29	8 44.97	0.716	23 35 54.92
Thur.	18	23 48 19.13	9.131	1 15 57.4	59.31	8 27.66	0.725	23 39 51.47
Fri.	19	23 51 58.18	9.123	0 52 13.8	+59.32	8 10.15	0.733	23 43 48.03
Sat.	20	23 55 37.04	9.116	0 28 30.3	59.30	7 52.46	0.740	23 47 44.58
SUN.	21	23 59 15.75	9.110	S. 0 4 47.2	59.27	7 34.62	0.746	23 51 41.13
Mon.	22	0 2 54.32	9.104	N. 0 18 55.0	+59.22	7 16.63	0.752	23 55 37.69
Tues.	23	0 6 32.76	9.100	0 42 36.0	59.16	6 58.52	0.757	23 59 34.24
Wed.	24	0 10 11.10	9.096	1 6 15.4	59.08	6 40.30	0.761	0 3 30.80
Thur.	25	0 13 49.35	9.093	1 29 52.9	+59.00	6 22.00	0.764	0 7 27.35
Fri.	26	0 17 27.55	9.091	1 53 28.1	58.91	6 3.64	0.766	0 11 23.90
Sat.	27	0 21 5.70	9.090	2 17 0.6	58.79	5 45.24	0.767	0 15 20.46
SUN.	28	0 24 43.83	9.089	2 40 30.2	+58.66	5 26.82	0.768	0 19 17.01
Mon.	29	0 28 21.96	9.090	3 3 56.5	58.52	5 8.40	0.767	0 23 13.56
Tues.	30	0 32 0.12	9.091	3 27 19.2	58.36	4 50.00	0.765	0 27 10.12
Wed.	31	0 35 38.33	9.094	3 50 37.8	58.19	4 31.66	0.762	0 31 6.67
Thur.	32	0 39 16.61	9.097	N. 4 13 52.3	+58.01	4 13.39	0.759	0 35 3.22

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing; north declinations, increasing.

Diff. for 1 Hour,  
+9<sup>s</sup>.8565.  
(Table III.)

AT GREENWICH MEAN NOON.													
Day of the Month.	Day of the Year.	THE SUN'S						Logarithm of the Radius Vector of the Earth.	Diff. for 1 Hour.	Mean Time of Sidereal Noon.			
		True Longitude.			Diff. for 1 Hour.	Latitude.							
		$\lambda$	$\lambda'$										
		°	'	"	'	"	"			h	m	s	
1	60	339	50	14.0	49	55.5	150.48	− 0.03	9.996 0493	+44.8	1	26	55.66
2	61	340	50	24.5	50	5.8	150.40	0.16	9.996 1576	45.6	1	22	59.75
3	62	341	50	33.2	50	14.4	150.33	0.28	9.996 2676	46.3	1	19	3.84
4	63	342	50	40.2	50	21.3	150.26	− 0.38	9.996 3793	+46.9	1	15	7.94
5	64	343	50	45.5	50	26.5	150.19	0.45	9.996 4926	47.4	1	11	12.03
6	65	344	50	49.2	50	30.1	150.12	0.49	9.996 6073	48.0	1	7	16.12
7	66	345	50	51.4	50	32.2	150.06	− 0.50	9.996 7232	+48.5	1	3	20.21
8	67	346	50	52.0	50	32.6	149.99	0.47	9.996 8402	48.9	0	59	24.30
9	68	347	50	51.0	50	31.5	149.92	0.41	9.996 9582	49.3	0	55	28.40
10	69	348	50	48.4	50	28.8	149.85	− 0.33	9.997 0768	+49.5	0	51	32.49
11	70	349	50	44.1	50	24.4	149.78	0.21	9.997 1960	49.7	0	47	36.58
12	71	350	50	38.1	50	18.3	149.71	− 0.08	9.997 3156	49.9	0	43	40.67
13	72	351	50	30.4	50	10.5	149.64	+ 0.06	9.997 4354	+50.0	0	39	44.76
14	73	352	50	20.8	50	0.8	149.56	0.19	9.997 5555	50.0	0	35	48.86
15	74	553	50	9.4	49	49.3	149.48	0.32	9.997 6757	50.1	0	31	52.95
16	75	354	49	56.0	49	35.8	149.40	+ 0.44	9.997 7959	+50.1	0	27	57.04
17	76	355	49	40.5	49	20.2	149.31	0.54	9.997 9161	50.1	0	24	1.14
18	77	356	49	23.0	49	2.6	149.22	0.61	9.998 0364	50.1	0	20	5.23
19	78	357	49	3.3	48	42.8	149.13	+ 0.66	9.998 1568	+50.2	0	16	9.32
20	79	358	48	41.4	48	20.8	149.04	0.69	9.998 2772	50.2	0	12	13.41
21	80	359	48	17.3	47	56.6	148.95	0.68	9.998 3978	50.3	0	8	17.50
22	81	0	47	51.0	47	30.1	148.86	+ 0.65	9.998 5186	+50.4	0	4	21.60
23	82	1	47	22.3	47	1.4	148.76	0.60	9.998 6395	50.5	0	0	25.69
24	83	2	46	51.4	46	30.3	148.67	0.52	9.998 7608	50.6	23	56	29.78
25	84	3	46	18.1	45	56.9	148.57	+ 0.41	9.998 8823	+50.7	23	52	33.87
26	85	4	45	42.5	45	21.2	148.47	0.30	9.999 0043	50.9	23	48	37.96
27	86	5	45	4.7	44	43.3	148.37	0.18	9.999 1269	51.2	23	44	42.06
28	87	6	44	24.5	44	3.0	148.28	+ 0.05	9.999 2500	+51.4	23	40	46.15
29	88	7	43	42.2	43	20.5	148.19	− 0.08	9.999 3738	51.7	23	36	50.24
30	89	8	42	57.6	42	35.9	148.10	0.20	9.999 4983	52.0	23	32	54.33
31	90	9	42	11.0	41	49.1	148.01	0.30	9.999 6236	52.3	23	28	58.42
32	91	10	41	22.3	41	0.3	147.93	− 0.37	9.999 7495	+52.6	23	25	2.52
											23	21	6.61

NOTE.—The longitudes in the column  $\lambda$  are referred to the true equinox of their own date, while those in the column  $\lambda'$  are referred to the mean equinox of the beginning of the Besselian fictitious year.

Diff. for 1 Hour,  
−9<sup>s</sup>.8296.  
(Table II.)

GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 59.9	16 4.7	58 37.05	+1.561	58 54.78	+1.388	12 22.0	1.99	15.3
2	16 9.0	16 12.5	59 10.27	1.190	59 23.26	0.972	13 9.9	2.01	16.3
3	16 15.3	16 17.4	59 33.56	0.743	59 41.06	0.507	13 58 9	2.08	17.3
4	16 18.6	16 19.2	59 45.75	+0.276	59 47.72	+0.055	14 50.2	2.20	18.3
5	16 19.0	16 18.2	59 47.12	-0.151	59 44.16	-0.339	15 44.7	2.34	19.3
6	16 16.8	16 14.9	59 39.09	0.504	59 32.17	0.646	16 42.7	2.49	20.3
7	16 12.6	16 10.0	59 23.69	-0.763	59 13.92	-0.861	17 43.6	2.57	21.3
8	16 7.0	16 3.8	59 3.09	0.941	58 51.41	1.003	18 45.4	2.56	22.3
9	16 0.5	15 56.9	58 39.06	1.053	58 26.18	1.092	19 45.9	2.45	23.3
10	15 53.3	15 49.6	58 12.90	-1.121	57 59.29	-1.147	20 42.9	2.28	24.3
11	15 45.8	15 42.0	57 45.40	1.168	57 31.27	1.187	21 35.5	2.10	25.3
12	15 38.1	15 34.1	57 16.92	1.205	57 2.38	1.219	22 24.1	1.95	26.3
13	15 30.1	15 26.1	56 47.70	-1.229	56 32.92	-1.234	23 9.2	1.82	27.3
14	15 22.0	15 18.0	56 18.10	1.234	56 3.33	1.226	23 52.1	1.75	28.3
15	15 14.0	15 10.1	55 48.72	1.207	55 34.40	1.176	6	.	29.3
16	15 6.4	15 2.8	55 20.54	-1.131	55 7.30	-1.073	0 33.7	1.73	0.7
17	14 59.4	14 56.2	54 54.86	0.998	54 43.41	0.907	1 15.3	1.74	1.7
18	14 53.4	14 51.0	54 33.16	0.798	54 24.32	0.673	1 57.6	1.79	2.7
19	14 49.1	14 47.6	54 17.09	-0.530	54 11.66	-0.372	2 41.6	1.88	3.7
20	14 46.6	14 46.3	54 8.20	-0.202	54 6.87	-0.018	3 27.7	1.97	4.7
21	14 46.6	14 47.5	54 7.82	+0.178	54 11.17	+0.382	4 16.1	2.07	5.7
22	14 49.0	14 51.3	54 17.00	+0.591	54 25.38	+0.806	5 6.7	2.14	6.7
23	14 54.3	14 58.0	54 36.34	1.021	54 49.86	1.231	5 58.6	2.18	7.7
24	15 2.4	15 7.4	55 5.87	1.435	55 24.25	1.627	6 50.8	2.17	8.7
25	15 13.0	15 19.1	55 44.84	+1.803	56 7.42	+1.957	7 42.4	2.13	9.7
26	15 25.8	15 32.7	56 31.70	2.085	56 57.33	2.180	8 32.7	2.07	10.7
27	15 40.0	15 47.3	57 23.88	2.237	57 50.85	2.251	9 21.7	2.02	11.7
28	15 54.6	16 1.8	58 17.70	+2.217	58 43.86	+2.134	10 9.9	2.00	12.7
29	16 8.5	16 14.8	59 8.72	2.000	59 31.65	1.813	10 57.9	2.02	13.7
30	16 20.4	16 25.1	59 52.05	1.579	60 9.38	1.303	11 47.1	2.09	14.7
31	16 28.8	16 31.6	60 23.21	0.997	60 33.22	+0.669	12 38.6	2.21	15.7
32	16 33.2	16 33.7	60 39.21	+0.329	60 41.11	-0.011	13 33.5	2.37	16.7

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.



MEAN TIME.

THE MOON'S RIGHT

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MEAN TIME.

THE MOON'S RIGHT

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MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

~~31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1~~ MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Added to		Diff. for Ho
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.	Subtracted from Apparent Time.				
		h m s	s	° ' "	"	' "	s	m s	s		
Thur.	1	0 39 17.25	9.096	N. 4 13 56.4	+57.99	16 2.05	64.47	4 13.33	0.7		
Fri.	2	0 42 55.58	9.100	4 37 6.0	57.80	16 1.77	64.49	3 55.16	0.7		
Sat.	3	0 46 34.04	9.105	5 0 10.7	57.59	16 1.49	64.51	3 37.11	0.7		
SUN.	4	0 50 12.64	9.112	5 23 10.2	+57.37	16 1.21	64.53	3 19.21	0.7		
Mon.	5	0 53 51.40	9.119	5 46 4.3	57.13	16 0.93	64.55	3 1.47	0.7		
Tues.	6	0 57 30.36	9.127	6 8 52.4	56.88	16 0.65	64.57	2 43.91	0.7		
Wed.	7	1 1 9.51	9.136	6 31 34.3	+56.61	16 0.36	64.60	2 26.57	0.7		
Thur.	8	1 4 48.89	9.146	6 54 9.6	56.33	16 0.08	64.63	2 9.44	0.7		
Fri.	9	1 8 28.51	9.156	7 16 38.0	56.03	15 59.80	64.67	1 52.55	0.6		
Sat.	10	1 12 8.39	9.167	7 38 59.1	+55.72	15 59.52	64.71	1 35.92	0.6		
SUN.	11	1 15 48.54	9.179	8 1 12.6	55.39	15 59.24	64.75	1 19.56	0.6		
Mon.	12	1 19 28.97	9.191	8 23 18.1	55.05	15 58.97	64.79	1 3.48	0.6		
Tues.	13	1 23 9.70	9.204	8 45 15.1	+54.70	15 58.70	64.83	0 47.70	0.6		
Wed.	14	1 26 50.74	9.217	9 7 3.5	54.33	15 58.43	64.88	0 32.23	0.6		
Thur.	15	1 30 32.12	9.231	9 28 42.7	53.94	15 58.16	64.93	0 17.09	0.6		
Fri.	16	1 34 13.82	9.245	9 50 12.4	+53.54	15 57.89	64.98	0 2.28	0.6		
Sat.	17	1 37 55.88	9.260	10 11 32.4	53.12	15 57.62	65.03	0 12.17	0.6		
SUN.	18	1 41 38.30	9.275	10 32 42.2	52.69	15 57.36	65.09	0 26.27	0.6		
Mon.	19	1 45 21.10	9.291	10 53 41.5	+52.25	15 57.10	65.15	0 39.99	0.6		
Tues.	20	1 49 4.28	9.308	11 14 29.9	51.79	15 56.84	65.21	0 53.32	0.6		
Wed.	21	1 52 47.87	9.325	11 35 7.2	51.31	15 56.59	65.27	1 6.26	0.6		
Thur.	22	1 56 31.86	9.342	11 55 32.9	+50.82	15 56.34	65.33	1 18.78	0.6		
Fri.	23	2 0 16.28	9.360	12 15 46.7	50.32	15 56.09	65.39	1 30.88	0.6		
Sat.	24	2 4 1.14	9.378	12 35 48.4	49.81	15 55.84	65.46	1 42.56	0.6		
SUN.	25	2 7 46.43	9.397	12 55 37.6	+49.28	15 55.59	65.53	1 53.79	0.6		
Mon.	26	2 11 32.19	9.416	13 15 14.1	48.74	15 55.34	65.60	2 4.55	0.6		
Tues.	27	2 15 18.42	9.436	13 34 37.4	48.19	15 55.09	65.67	2 14.85	0.6		
Wed.	28	2 19 5.14	9.457	13 53 47.4	+47.63	15 54.85	65.74	2 24.66	0.6		
Thur.	29	2 22 52.35	9.478	14 12 43.6	47.05	15 54.60	65.81	2 33.98	0.6		
Fri.	30	2 26 40.08	9.500	14 31 25.9	46.46	15 54.36	65.89	2 42.77	0.6		
Sat.	31	2 30 28.34	9.522	N. 14 49 53.9	+45.86	15 54.12	65.97	2 51.04	0.6		

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0°.18 from the sidereal time.

The sign + prefixed to the hourly change of declination indicates that north declinations are increased.

AT GREENWICH MEAN NOON.

Day of the Month.	THE SUN'S					Equation of Time, to be Subtracted from	Diff. for 1 Hour.	Sidereal Time, or Right Ascen- sion of Mean Sun.
	Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Decli- nation.	Diff. for 1 Hour.	Added to Mean Time.			
h m s	s	° ' "	"	m s	s	h m s		
1	0 39 16.61	9.097	N. 4 13 52.3	+58.01	4 13.39	0.759	0 35 3.22	
2	0 42 54.99	9.102	4 37 2.2	57.81	3 55.21	0.755	0 38 59.78	
3	0 46 33.49	9.107	5 0 7.2	57.60	3 37.16	0.749	0 42 56.33	
4	0 50 12.14	9.114	5 23 7.1	+57.38	3 19.25	0.743	0 46 52.88	
5	0 53 50.94	9.121	5 46 1.4	57.14	3 1.50	0.736	0 50 49.44	
6	0 57 29.94	9.129	6 8 49.8	56.89	2 43.95	0.727	0 54 45.99	
7	1 1 9.14	9.138	6 31 32.0	+56.62	2 26.60	0.718	0 58 42.55	
8	1 4 48.56	9.148	6 54 7.6	56.34	2 9.46	0.709	1 2 39.10	
9	1 8 28.23	9.158	7 16 36.3	56.04	1 52.57	0.699	1 6 35.65	
10	1 12 8.14	9.169	7 38 57.6	+55.73	1 35.94	0.688	1 10 32.21	
11	1 15 48.33	9.180	8 1 11.4	55.41	1 19.57	0.676	1 14 28.76	
12	1 19 28.81	9.192	8 23 17.1	55.07	1 3.49	0.664	1 18 25.32	
13	1 23 9.58	9.205	8 45 14.4	+54.71	0 47.71	0.651	1 22 21.87	
14	1 26 50.66	9.218	9 7 3.0	54.34	0 32.24	0.638	1 26 18.42	
15	1 30 32.07	9.232	9 28 42.4	53.95	0 17.09	0.624	1 30 14.98	
16	1 34 13.82	9.247	9 50 12.4	+53.54	0 2.28	0.610	1 34 11.53	
17	1 37 55.92	9.262	10 11 32.6	53.12	0 12.17	0.595	1 38 8.09	
18	1 41 38.37	9.277	10 32 42.6	52.69	0 26.27	0.580	1 42 4.64	
19	1 45 21.21	9.293	10 53 42.1	+52.25	0 39.99	0.564	1 46 1.20	
20	1 49 4.42	9.309	11 14 30.7	51.79	0 53.33	0.547	1 49 57.75	
21	1 52 48.04	9.326	11 35 8.1	51.32	1 6.27	0.531	1 53 54.31	
22	1 56 32.07	9.343	11 55 34.0	+50.83	1 18.80	0.513	1 57 50.86	
23	2 0 16.52	9.361	12 15 48.0	50.33	1 30.90	0.495	2 1 47.42	
24	2 4 1.40	9.379	12 35 49.9	49.82	1 42.57	0.477	2 5 43.97	
25	2 7 46.73	9.398	12 55 39.2	+49.29	1 53.80	0.458	2 9 40.53	
26	2 11 32.52	9.417	13 15 15.8	48.75	2 4.57	0.439	2 13 37.08	
27	2 15 18.77	9.437	13 34 39.2	48.20	2 14.86	0.419	2 17 33.64	
28	2 19 5.52	9.458	13 53 49.3	+47.64	2 24.68	0.398	2 21 30.19	
29	2 22 52.76	9.479	14 12 45.6	47.06	2 33.99	0.377	2 25 26.75	
30	2 26 40.51	9.501	14 31 28.0	46.47	2 42.79	0.355	2 29 23.30	
31	2 30 28.80	9.523	N. 14 49 56.1	+45.87	2 51.06	0.333	2 33 19.86	

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign + prefixed to the hourly change of declination indicates that north declinations are increasing.

Diff. for 1 Hour,  
+9<sup>h</sup>.8565.  
(Table III.)

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Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	16 33.2	16 33.7	60 39.21	+0.329	60 41.11	−0.011	13 33.5	2.37	16.7
2	16 33.2	16 31.5	60 39.00	−0.338	60 33.10	0.640	14 32.2	2.52	17.7
3	16 29.0	16 25.6	60 23.76	0.910	60 11.40	1.143	15 34.3	2.63	18.7
4	16 21.6	16 16.9	59 56.49	−1.336	59 39.50	−1.488	16 37.9	2.64	19.7
5	16 11.9	16 6.5	59 20.95	1.598	59 1.31	1.670	17 40.1	2.53	20.7
6	16 1.0	15 55.4	58 41.01	1.708	58 20.44	1.716	18 38.8	2.35	21.7
7	15 49.8	15 44.3	57 59.93	−1.699	57 39.73	−1.665	19 32.7	2.14	22.7
8	15 38.9	15 33.7	57 20.03	1.616	57 1.00	1.555	20 22.0	1.97	23.7
9	15 28.8	15 24.0	56 42.74	1.487	56 25.32	1.416	21 7.4	1.83	24.7
10	15 19.5	15 15.2	56 8.78	−1.341	55 53.14	−1.266	21 50.3	1.75	25.7
11	15 11.2	15 7.4	55 38.40	1.192	55 24.54	1.118	22 31.7	1.71	26.7
12	15 3.9	15 0.6	55 11.57	1.043	54 59.52	0.966	23 12.8	1.72	27.7
13	14 57.6	14 54.8	54 48.40	−0.888	54 38.22	−0.808	23 54.5	1.76	28.7
14	14 52.3	14 50.1	54 29.02	0.723	54 20.89	0.631	6	.	0.0
15	14 48.2	14 46.6	54 13.91	0.531	54 8.17	0.424	0 37.7	1.84	1.0
16	14 45.4	14 44.6	54 3.78	−0.306	54 0.86	−0.179	1 23.0	1.94	2.0
17	14 44.3	14 44.4	53 59.53	−0.041	53 59.92	+0.109	2 10.7	2.03	3.0
18	14 45.0	14 46.2	54 2.18	+0.270	54 6.43	0.440	3 0.4	2.10	4.0
19	14 47.9	14 50.2	54 12.77	+0.618	54 21.30	+0.805	3 51.5	2.14	5.0
20	14 53.2	14 56.8	54 32.11	0.998	54 45.26	1.195	4 43.0	2.14	6.0
21	15 1.0	15 5.8	55 0.79	1.392	55 18.66	1.585	5 33.9	2.10	7.0
22	15 11.3	15 17.4	55 38.80	+1.771	56 1.11	+1.945	6 23.5	2.03	8.0
23	15 24.0	15 31.1	56 25.40	2.101	56 51.43	2.233	7 11.6	1.98	9.0
24	15 38.6	15 46.4	57 18.87	2.335	57 47.33	2.402	7 58.7	1.95	10.0
25	15 54.3	16 2.2	58 16.33	+2.424	58 45.30	+2.396	8 45.5	1.96	11.0
26	16 9.9	16 17.2	59 13.61	2.313	59 40.57	2.170	9 33.2	2.02	12.0
27	16 24.0	16 30.0	60 5.46	1.969	60 27.59	1.710	10 23.1	2.14	13.0
28	16 35.1	16 39.1	60 46.29	+1.398	61 0.97	+1.042	11 16.5	2.31	14.0
29	16 41.9	16 43.4	61 11.17	+0.654	61 16.60	+0.248	12 14.4	2.51	15.0
30	16 43.5	16 42.3	61 17.11	−0.163	61 12.74	−0.562	13 16.9	2.68	16.0
31	16 39.9	16 36.3	61 3.74	−0.933	60 50.50	−1.266	14 22.4	2.75	17.0



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MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.



GR

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

G MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

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**APRIL, 1915.**

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**GREENWICH MEAN TIME.**

**THE MOON'S RIGHT**

**AND DECLINATION.**

MEAN TIME.

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THE MOON'S RIGHT ~~ASCENSION~~ AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

THURSDAY 29.					SATURDAY, MAY 1.							
h	m	s	s	° ' "	Hour.	h	m	s	s	° ' "	° ' "	
14	10	51.22	2.4858	S. 18 17 51.2		16	17	57.54	2.7746	S. 26 19 21.4	5.698	
14	13	20.59	2.4933	18 31 26.5								
14	15	50.41	2.5008	18 44 54.6								
14	18	20.68	2.5082	18 58 15.5								
14	20	51.39	2.5155	19 11 29.0								
14	23	22.54	2.5229	19 24 35.0								
14	25	54.14	2.5304	19 37 33.3								
14	28	26.19	2.5378	19 50 23.9								
14	30	58.68	2.5452	20 3 6.5								
14	33	31.61	2.5524	20 15 41.1								
14	36	4.97	2.5598	20 28 7.4								
14	38	38.78	2.5671	20 40 25.4								
14	41	13.02	2.5743	20 52 35.0								
14	43	47.70	2.5815	21 4 36.0								
14	46	22.80	2.5887	21 16 28.2								
14	48	58.34	2.5958	21 28 11.6								
14	51	34.30	2.6028	21 39 46.0								
14	54	10.68	2.6098	21 51 11.2								
14	56	47.48	2.6168	22 2 27.2								
14	59	24.70	2.6238	22 13 33.8								
15	2	2.33	2.6305	22 24 30.9								
15	4	40.36	2.6372	22 35 18.4								
15	7	18.79	2.6438	22 45 56.2								
15	9	57.62	2.6504	S. 22 56 24.1								
FRIDAY 30.					PHASES OF THE MOON.							
15	12	36.84	2.6569	S. 23 6 42.0		☾	Last Quarter	. . . . .	Apr.	d h m	6 8 12.4	
15	15	16.45	2.6633	23 16 49.8		●	New Moon	. . . . .		13 23 35.7		
15	17	56.44	2.6696	23 26 47.4		☽	First Quarter	. . . . .		22 3 39.1		
15	20	36.80	2.6758	23 36 34.6		○	Full Moon	. . . . .		29 2 19.3		
15	23	17.53	2.6818	23 46 11.4								
15	25	58.62	2.6878	23 55 37.7		☾	Perigee	. . . . .	Apr.	d h	1 11.6	
15	28	40.07	2.6937	24 4 53.2		☾	Apogee	. . . . .		17 3.6		
15	31	21.86	2.6994	24 13 58.0		☾	Perigee	. . . . .		29 19.2		
15	34	4.00	2.7051	24 22 52.0								
15	36	46.47	2.7105	24 31 34.9								
15	39	29.26	2.7158	24 40 6.8								
15	42	12.37	2.7211	24 48 27.5								
15	44	55.79	2.7262	24 56 37.0								
15	47	39.51	2.7311	25 4 35.1								
15	50	23.52	2.7358	25 12 21.7								
15	53	7.81	2.7405	25 19 56.8								
15	55	52.38	2.7450	25 27 20.3								
15	58	37.21	2.7493	25 34 32.1								
16	1	22.29	2.7534	25 41 32.2								
16	4	7.62	2.7574	25 48 20.4								
16	6	53.18	2.7612	25 54 56.7								
16	9	38.96	2.7648	26 1 21.0								
16	12	24.96	2.7683	26 7 33.3								
16	15	11.16	2.7715	26 13 33.4								
16	17	57.54	2.7746	S. 26 19 21.4								



AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Subtracted from Apparent Time.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.		
		h m s	s	° ' "	"	' "	s	m s
Sat.	1	2 30 28.34	9.522	N. 14 49 53.9	+45.86	15 54.12	65.97	2 51.04
SUN.	2	2 34 17.14	9.545	15 8 7.3	45.25	15 53.87	66.05	2 58.78
Mon.	3	2 38 6.50	9.568	15 26 5.8	44.62	15 53.63	66.13	3 5.96
Tues.	4	2 41 56.42	9.592	15 43 49.3	+43.98	15 53.39	66.21	3 12.58
Wed.	5	2 45 46.90	9.616	16 1 17.2	43.33	15 53.15	66.29	3 18.64
Thur.	6	2 49 37.97	9.640	16 18 29.2	42.67	15 52.91	66.37	3 24.11
Fri.	7	2 53 29.62	9.664	16 35 25.2	+41.99	15 52.68	66.45	3 29.00
Sat.	8	2 57 21.85	9.689	16 52 4.7	41.30	15 52.46	66.53	3 33.32
SUN.	9	3 1 14.67	9.713	17 8 27.5	40.59	15 52.24	66.61	3 37.04
Mon.	10	3 5 8.08	9.738	17 24 33.1	+39.87	15 52.02	66.70	3 40.18
Tues.	11	3 9 2.08	9.762	17 40 21.3	39.14	15 51.80	66.78	3 42.73
Wed.	12	3 12 56.66	9.786	17 55 51.8	38.40	15 51.58	66.86	3 44.70
Thur.	13	3 16 51.82	9.810	18 11 4.3	+37.64	15 51.37	66.94	3 46.09
Fri.	14	3 20 47.56	9.834	18 25 58.4	36.87	15 51.16	67.02	3 46.90
Sat.	15	3 24 43.88	9.858	18 40 33.9	36.09	15 50.95	67.10	3 47.15
SUN.	16	3 28 40.76	9.882	18 54 50.5	+35.29	15 50.75	67.18	3 46.82
Mon.	17	3 32 38.21	9.905	19 8 47.9	34.48	15 50.56	67.27	3 45.93
Tues.	18	3 36 36.22	9.928	19 22 25.8	33.67	15 50.37	67.35	3 44.48
Wed.	19	3 40 34.77	9.951	19 35 43.9	+32.84	15 50.19	67.43	3 42.49
Thur.	20	3 44 33.86	9.973	19 48 42.0	32.00	15 50.01	67.51	3 39.96
Fri.	21	3 48 33.49	9.995	20 1 19.8	31.15	15 49.83	67.59	3 36.90
Sat.	22	3 52 33.64	10.017	20 13 37.0	+30.29	15 49.66	67.66	3 33.32
SUN.	23	3 56 34.30	10.038	20 25 33.5	29.42	15 49.49	67.74	3 29.22
Mon.	24	4 0 35.48	10.059	20 37 9.0	28.54	15 49.32	67.81	3 24.62
Tues.	25	4 4 37.14	10.080	20 48 23.2	+27.65	15 49.15	67.89	3 19.53
Wed.	26	4 8 39.30	10.100	20 59 16.0	26.75	15 48.99	67.96	3 13.94
Thur.	27	4 12 41.94	10.120	21 9 47.2	25.84	15 48.83	68.03	3 7.87
Fri.	28	4 16 45.06	10.140	21 19 56.4	+24.92	15 48.67	68.10	3 1.33
Sat.	29	4 20 48.65	10.159	21 29 43.6	24.00	15 48.52	68.16	2 54.32
SUN.	30	4 24 52.70	10.178	21 39 8.6	23.07	15 48.37	68.22	2 46.85
Mon.	31	4 28 57.20	10.197	21 48 11.1	22.13	15 48.22	68.28	2 38.93
Tues.	32	4 33 2.15	10.215	N. 21 56 51.0	+21.18	15 48.07	68.33	2 30.56

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0<sup>s</sup>.18 from the time.  
The sign + prefixed to the hourly change of declination indicates that north declinations are increasing.

AT GREENWICH MEAN NOON.

Day of the Month.	THE SUN'S				Equation of Time, to be Added to Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
	Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
	h m s	s	° ' "	"	m s	s	h m s
1	2 30 28.80	9.523	N. 14 49 56.1	+45.87	2 51.06	0.333	2 33 19.86
2	2 34 17.62	9.546	15 8 9.6	45.26	2 58.80	0.311	2 37 16.42
3	2 38 6.99	9.569	15 26 8.2	44.63	3 5.98	0.288	2 41 12.97
4	2 41 56.93	9.592	15 43 51.6	+43.99	3 12.60	0.264	2 45 9.53
5	2 45 47.43	9.616	16 1 19.6	43.33	3 18.65	0.240	2 49 6.08
6	2 49 38.51	9.640	16 18 31.7	42.66	3 24.12	0.216	2 53 2.64
7	2 53 30.18	9.665	16 35 27.6	+41.99	3 29.02	0.192	2 56 59.19
8	2 57 22.42	9.689	16 52 7.2	41.30	3 33.32	0.167	3 0 55.75
9	3 1 15.26	9.714	17 8 29.9	40.59	3 37.05	0.143	3 4 52.31
10	3 5 8.68	9.738	17 24 35.6	+39.87	3 40.18	0.118	3 8 48.86
11	3 9 2.68	9.762	17 40 23.7	39.14	3 42.74	0.094	3 12 45.42
12	3 12 57.27	9.787	17 55 54.2	38.40	3 44.71	0.070	3 16 41.98
13	3 16 52.44	9.811	18 11 6.7	+37.64	3 46.10	0.046	3 20 38.53
14	3 20 48.18	9.835	18 26 0.8	36.87	3 46.91	0.022	3 24 35.09
15	3 24 44.50	9.858	18 40 36.2	36.08	3 47.14	0.001	3 28 31.65
16	3 28 41.39	9.882	18 54 52.8	+35.28	3 46.82	0.025	3 32 28.20
17	3 32 38.84	9.905	19 8 50.1	34.47	3 45.92	0.049	3 36 24.76
18	3 36 36.84	9.928	19 22 27.9	33.65	3 44.48	0.072	3 40 21.32
19	3 40 35.39	9.951	19 35 45.9	+32.83	3 42.49	0.094	3 44 17.87
20	3 44 34.47	9.973	19 48 43.9	31.99	3 39.96	0.116	3 48 14.43
21	3 48 34.10	9.995	20 1 21.7	31.14	3 36.89	0.138	3 52 10.99
22	3 52 34.23	10.016	20 13 38.8	+30.28	3 33.31	0.160	3 56 7.54
23	3 56 34.89	10.038	20 25 35.2	29.41	3 29.21	0.181	4 0 4.10
24	4 0 36.05	10.059	20 37 10.6	28.53	3 24.61	0.202	4 4 0.66
25	4 4 37.70	10.079	20 48 24.7	+27.64	3 19.52	0.223	4 7 57.22
26	4 8 39.84	10.099	20 59 17.5	26.74	3 13.93	0.243	4 11 53.78
27	4 12 42.47	10.119	21 9 48.5	25.84	3 7.86	0.263	4 15 50.33
28	4 16 45.57	10.139	21 19 57.7	+24.93	3 1.32	0.282	4 19 46.89
29	4 20 49.14	10.158	21 29 44.8	24.01	2 54.31	0.302	4 23 43.45
30	4 24 53.17	10.177	21 39 9.7	23.07	2 46.84	0.321	4 27 40.01
31	4 28 57.65	10.196	21 48 12.1	22.13	2 38.91	0.339	4 31 36.56
32	4 33 2.58	10.214	N. 21 56 51.9	+21.18	2 30.54	0.357	4 35 33.12

—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign + prefixed to the hourly change of declination indicates that north declinations are increasing.

Diff. for 1 Hour,  
+9<sup>s</sup>.8565.  
(Table III.)

AT GREENWICH MEAN NOON.													
Day of the Month.	Day of the Year.	THE SUN'S						Logarithm of the Radius Vector of the Earth.	Diff. for 1 Hour.	Mean Time of Sidereal Noon.			
		True Longitude.			Diff. for 1 Hour.	Latitude.							
		°	'	"									
1	121	40	2	15.8	1	50.1	145.50	−0.38	0.003 3479	+46.1	21	23	9.35
2	122	41	0	27.1	0	1.3	145.44	0.34	0.003 4584	45.9	21	19	13.44
3	123	41	58	36.8	58	10.9	145.38	0.27	0.003 5682	45.6	21	15	17.53
4	124	42	56	45.1	56	19.0	145.32	−0.17	0.003 6774	+45.3	21	11	21.62
5	125	43	54	52.0	54	25.8	145.26	−0.05	0.003 7858	44.9	21	7	25.71
6	126	44	52	57.4	52	31.1	145.20	+0.08	0.003 8930	44.4	21	3	29.80
7	127	45	51	1.6	50	35.1	145.14	+0.20	0.003 9990	+43.9	20	59	33.89
8	128	46	49	4.4	48	37.7	145.09	0.33	0.004 1037	43.3	20	55	37.98
9	129	47	47	5.7	46	38.9	145.03	0.45	0.004 2069	42.6	20	51	42.07
10	130	48	45	5.7	44	38.7	144.97	+0.54	0.004 3084	+41.9	20	47	46.16
11	131	49	43	4.3	42	37.1	144.91	0.62	0.004 4083	41.2	20	43	50.25
12	132	50	41	1.4	40	34.0	144.85	0.68	0.004 5063	40.5	20	39	54.34
13	133	51	38	57.0	38	29.6	144.79	+0.72	0.004 6025	+39.7	20	35	58.43
14	134	52	36	51.2	36	23.6	144.72	0.72	0.004 6969	38.9	20	32	2.52
15	135	53	34	43.8	34	16.0	144.66	0.70	0.004 7892	38.1	20	28	6.61
16	136	54	32	35.0	32	7.0	144.59	+0.66	0.004 8797	+37.3	20	24	10.70
17	137	55	30	24.6	29	56.4	144.53	0.60	0.004 9683	36.5	20	20	14.79
18	138	56	28	12.6	27	44.3	144.47	0.51	0.005 0550	35.7	20	16	18.88
19	139	57	25	59.0	25	30.5	144.40	+0.39	0.005 1398	+34.9	20	12	22.96
20	140	58	23	43.8	23	15.2	144.33	0.27	0.005 2227	34.2	20	8	27.05
21	141	59	21	27.0	20	58.2	144.27	0.14	0.005 3040	33.5	20	4	31.14
22	142	60	19	8.5	18	39.6	144.20	+0.01	0.005 3836	+32.8	20	0	35.23
23	143	61	16	48.5	16	19.4	144.13	−0.11	0.005 4616	32.2	19	56	39.32
24	144	62	14	26.9	13	57.6	144.07	0.23	0.005 5383	31.7	19	52	43.41
25	145	63	12	3.8	11	34.3	144.01	−0.31	0.005 6136	+31.2	19	48	47.50
26	146	64	9	39.2	9	9.6	143.95	0.36	0.005 6878	30.7	19	44	51.58
27	147	65	7	13.3	6	43.5	143.89	0.38	0.005 7608	30.2	19	40	55.67
28	148	66	4	46.1	4	16.1	143.84	−0.37	0.005 8328	+29.8	19	36	59.76
29	149	67	2	17.7	1	47.5	143.79	0.33	0.005 9038	29.4	19	33	3.85
30	150	67	59	48.2	59	17.9	143.75	0.27	0.005 9738	28.9	19	29	7.94
31	151	68	57	17.8	56	47.3	143.72	0.17	0.006 0427	28.4	19	25	12.02
32	152	69	54	46.5	54	15.8	143.68	−0.05	0.006 1103	+27.9	19	21	16.11

NOTE.—The longitudes in the column  $\lambda$  are referred to the true equinox of their own date, while those in the column  $\lambda'$  are referred to the mean equinox of the beginning of the Besselian fictitious year.

Diff. for 1 Hour,  
−9<sup>s</sup>.8296.  
(Table II.)

GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	16 39.9	16 36.3	61 3.74	−0.933	60 50.50	−1.266	14 22.4	2.75	17.0
2	16 31.6	16 26.2	60 33.53	1.554	60 13.41	1.789	15 27.9	2.68	18.0
3	16 20.0	16 13.4	59 50.79	1.969	59 26.35	2.094	16 30.2	2.50	19.0
4	16 6.4	15 59.2	59 0.73	−2.167	58 34.53	−2.192	17 27.4	2.27	20.0
5	15 52.1	15 45.0	58 8.27	2.178	57 42.41	2.127	18 19.1	2.05	21.0
6	15 38.2	15 31.6	57 17.33	2.049	56 53.33	1.948	19 6.2	1.88	22.0
7	15 25.5	15 19.7	56 30.64	−1.831	56 9.42	−1.704	19 49.8	1.77	23.0
8	15 14.3	15 9.4	55 49.77	1.570	55 31.75	1.432	20 31.5	1.71	24.0
9	15 5.0	15 1.0	55 15.40	1.293	55 0.71	1.157	21 12.3	1.70	25.0
10	14 57.4	14 54.3	54 47.63	−1.025	54 36.11	−0.896	21 53.5	1.74	26.0
11	14 51.5	14 49.2	54 26.11	0.771	54 17.59	0.651	22 35.9	1.80	27.0
12	14 47.3	14 45.7	54 10.48	0.535	54 4.74	0.422	23 20.4	1.90	28.0
13	14 44.5	14 43.7	54 0.34	−0.311	53 57.28	−0.199	0	.	29.0
14	14 43.2	14 43.1	53 55.56	−0.088	53 55.18	+0.026	0 7.2	2.00	0.4
15	14 43.4	14 44.0	53 56.18	+0.142	53 58.60	0.263	0 56.3	2.09	1.4
16	14 45.1	14 46.6	54 2.53	+0.393	54 8.04	+0.527	1 47.1	2.13	2.4
17	14 48.6	14 51.0	54 15.19	0.665	54 24.04	0.811	2 38.4	2.13	3.4
18	14 53.9	14 57.3	54 34.69	0.966	54 47.23	1.126	3 29.2	2.09	4.4
19	15 1.2	15 5.7	55 1.71	+1.289	55 18.16	+1.453	4 18.6	2.02	5.4
20	15 10.7	15 16.3	55 36.57	1.615	55 56.92	1.775	5 6.2	1.95	6.4
21	15 22.3	15 28.9	56 19.13	1.925	56 43.07	2.062	5 52.3	1.90	7.4
22	15 35.8	15 43.1	57 8.54	+2.179	57 35.26	+2.270	6 37.6	1.88	8.4
23	15 50.6	15 58.3	58 2.89	2.329	58 31.01	2.350	7 23.2	1.92	9.4
24	16 5.9	16 13.4	58 59.09	2.322	59 26.54	2.244	8 10.3	2.02	10.4
25	16 20.5	16 27.1	59 52.71	+2.109	60 16.91	+1.915	9 0.5	2.18	11.4
26	16 33.0	16 37.9	60 38.43	1.663	60 56.59	1.355	9 55.1	2.38	12.4
27	16 41.8	16 44.4	61 10.75	0.998	61 20.40	+0.605	10 55.0	2.61	13.4
28	16 45.7	16 45.6	61 25.18	+0.189	61 24.89	−0.237	11 59.8	2.77	14.4
29	16 44.2	16 41.4	61 19.52	−0.656	61 9.25	1.051	13 7.1	2.80	15.4
30	16 37.4	16 32.2	60 54.44	1.410	60 35.61	1.720	14 13.2	2.68	16.4
31	16 26.2	16 19.4	60 13.38	1.975	59 48.44	2.171	15 14.9	2.45	17.4
32	16 12.0	16 4.3	59 21.51	−2.307	58 53.30	−2.385	16 10.8	2.21	18.4

MAY, 1915.

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.



**MEAN TIME.**

## THE MOON'S RIGHT

**AND DECLINATION.**



MAY, 1915.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

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THE MOON'S RIGHT ASCENSION AND DECLINATION.

**MEAN TIME.****THE MOON'S RIGHT****AND DECLINATION.**

AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Subtracted from	
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.	Added to Apparent Time.			
		h m s	s	° ' "	"	' "	s	m s		
Tues.	1	4 33 2.15	10.215	N.21 56 51.0	+21.18	15 48.07	68.33	2 30.56		
Wed.	2	4 37 7.53	10.233	22 5 8.1	20.23	15 47.92	68.39	2 21.76		
Thur.	3	4 41 13.33	10.250	22 13 2.1	19.27	15 47.78	68.44	2 12.55		
Fri.	4	4 45 19.53	10.266	22 20 32.9	+18.30	15 47.64	68.50	2 2.93		
Sat.	5	4 49 26.11	10.282	22 27 40.4	17.32	15 47.50	68.55	1 52.93		
SUN.	6	4 53 33.06	10.297	22 34 24.3	16.33	15 47.37	68.60	1 42.57		
Mon.	7	4 57 40.36	10.311	22 40 44.5	+15.34	15 47.25	68.64	1 31.85		
Tues.	8	5 1 47.98	10.324	22 46 40.9	14.35	15 47.13	68.68	1 20.82		
Wed.	9	5 5 55.91	10.336	22 52 13.2	13.35	15 47.02	68.72	1 9.48		
Thur.	10	5 10 4.12	10.347	22 57 21.5	+12.34	15 46.91	68.76	0 57.87		
Fri.	11	5 14 12.58	10.357	23 2 5.5	11.33	15 46.80	68.79	0 46.00		
Sat.	12	5 18 21.27	10.366	23 6 25.1	10.31	15 46.70	68.82	0 33.90		
SUN.	13	5 22 30.17	10.374	23 10 20.4	+ 9.29	15 46.61	68.84	0 21.59		
Mon.	14	5 26 39.24	10.381	23 13 51.0	8.27	15 46.52	68.87	0 9.11		
Tues.	15	5 30 48.47	10.387	23 16 57.1	7.24	15 46.43	68.89	0 3.53		
Wed.	16	5 34 57.83	10.392	23 19 38.5	+ 6.21	15 46.35	68.91	0 16.29		
Thur.	17	5 39 7.29	10.396	23 21 55.2	5.18	15 46.28	68.92	0 29.16		
Fri.	18	5 43 16.82	10.398	23 23 47.1	4.15	15 46.21	68.93	0 42.09		
Sat.	19	5 47 26.40	10.399	23 25 14.3	+ 3.12	15 46.15	68.94	0 55.08		
SUN.	20	5 51 36.00	10.400	23 26 16.7	2.08	15 46.09	68.95	1 8.09		
Mon.	21	5 55 45.61	10.399	23 26 54.3	1.05	15 46.04	68.95	1 21.10		
Tues.	22	5 59 55.18	10.398	23 27 7.1	+ 0.02	15 45.99	68.95	1 34.08		
Wed.	23	6 4 4.71	10.395	23 26 55.1	- 1.01	15 45.94	68.94	1 47.01		
Thur.	24	6 8 14.16	10.392	23 26 18.4	2.04	15 45.90	68.93	1 59.87		
Fri.	25	6 12 23.53	10.388	23 25 17.0	- 3.07	15 45.86	68.92	2 12.64		
Sat.	26	6 16 32.78	10.383	23 23 50.9	4.10	15 45.82	68.91	2 25.31		
SUN.	27	6 20 41.92	10.377	23 22 0.1	5.13	15 45.79	68.89	2 37.84		
Mon.	28	6 24 50.90	10.371	23 19 44.7	- 6.15	15 45.76	68.87	2 50.24		
Tues.	29	6 28 59.73	10.364	23 17 4.8	7.17	15 45.73	68.84	3 2.47		
Wed.	30	6 33 8.37	10.356	23 14 0.4	8.19	15 45.71	68.81	3 14.53		
Thur.	31	6 37 16.82	10.347	N.23 10 31.5	- 9.21	15 45.69	68.78	3 26.38		

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0.19 from the time.  
The sign + prefixed to the hourly change of declination indicates that north declinations are increasing sign - indicates that north declinations are decreasing.

AT GREENWICH MEAN NOON.

Day of the Week.	Day of the Month.	THE SUN'S				Equation of Time, to be Added to Subtracted from Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
		h m s	s	° ' "	"	m s	s	h m s
Tues.	1	4 33 2.58	10.214	N. 21 56 51.9	+21.18	2 30.54	0.357	4 35 33.12
Wed.	2	4 37 7.93	10.232	22 5 8.9	20.22	2 21.75	0.375	4 39 29.68
Thur.	3	4 41 13.70	10.249	22 13 2.8	19.26	2 12.54	0.392	4 43 26.24
Fri.	4	4 45 19.88	10.265	22 20 33.6	+18.29	2 2.92	0.408	4 47 22.80
Sat.	5	4 49 26.44	10.281	22 27 40.9	17.31	1 52.92	0.424	4 51 19.35
SUN.	6	4 53 33.36	10.296	22 34 24.8	16.33	1 42.55	0.439	4 55 15.91
Mon.	7	4 57 40.63	10.310	22 40 44.9	+15.34	1 31.84	0.453	4 59 12.47
Tues.	8	5 1 48.22	10.323	22 46 41.2	14.35	1 20.81	0.466	5 3 9.03
Wed.	9	5 5 56.11	10.335	22 52 13.5	13.35	1 9.48	0.478	5 7 5.59
Thur.	10	5 10 4.28	10.346	22 57 21.7	+12.34	0 57.86	0.489	5 11 2.14
Fri.	11	5 14 12.71	10.356	23 2 5.6	11.33	0 45.99	0.499	5 14 58.70
Sat.	12	5 18 21.37	10.365	23 6 25.2	10.31	0 33.90	0.508	5 18 55.26
SUN.	13	5 22 30.23	10.373	23 10 20.4	+ 9.29	0 21.59	0.516	5 22 51.82
Mon.	14	5 26 39.27	10.380	23 13 51.0	8.26	0 9.11	0.523	5 26 48.38
Tues.	15	5 30 48.46	10.386	23 16 57.1	7.24	0 3.53	0.529	5 30 44.94
Wed.	16	5 34 57.78	10.390	23 19 38.5	+ 6.21	0 16.29	0.534	5 34 41.50
Thur.	17	5 39 7.20	10.394	23 21 55.2	5.18	0 29.15	0.538	5 38 38.05
Fri.	18	5 43 16.70	10.397	23 23 47.1	4.15	0 42.09	0.540	5 42 34.61
Sat.	19	5 47 26.24	10.398	23 25 14.3	+ 3.12	0 55.07	0.541	5 46 31.17
SUN.	20	5 51 35.81	10.399	23 26 16.7	2.08	1 8.08	0.542	5 50 27.73
Mon.	21	5 55 45.37	10.398	23 26 54.3	1.05	1 21.08	0.541	5 54 24.29
Tues.	22	5 59 54.91	10.396	23 27 7.1	+ 0.02	1 34.06	0.539	5 58 20.85
Wed.	23	6 4 4.40	10.394	23 26 55.2	- 1.01	1 46.99	0.537	6 2 17.40
Thur.	24	6 8 13.82	10.391	23 26 18.5	2.04	1 59.86	0.534	6 6 13.96
Fri.	25	6 12 23.14	10.387	23 25 17.1	- 3.07	2 12.62	0.530	6 10 10.52
Sat.	26	6 16 32.36	10.382	23 23 51.1	4.10	2 25.28	0.525	6 14 7.08
SUN.	27	6 20 41.46	10.376	23 22 0.4	5.13	2 37.82	0.519	6 18 3.64
Mon.	28	6 24 50.41	10.370	23 19 45.0	- 6.15	2 50.22	0.513	6 22 0.20
Tues.	29	6 28 59.20	10.363	23 17 5.2	7.17	3 2.45	0.506	6 25 56.76
Wed.	30	6 33 7.81	10.355	23 14 0.8	8.19	3 14.50	0.498	6 29 53.31
Thur.	31	6 37 16.23	10.346	N. 23 10 32.0	- 9.21	3 26.36	0.489	6 33 49.87

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign + prefixed to the hourly change of declination indicates that north declinations are increasing; the sign - indicates that north declinations are decreasing.

Diff. for 1 Hour,  
+9<sup>s</sup>.8565.  
(Table III.)

AT GREENWICH MEAN NOON.													
Day of the Month.	Day of the Year.	THE SUN'S						Logarithm of the Radius Vector of the Earth.	Diff. for 1 Hour.	Mean Time of Sidereal Noon.			
		True Longitude.		Diff. for 1 Hour.	Latitude.								
		$\lambda$	$\lambda'$										
		°	'	"	'	"	"			h	m	s	
1	152	69	54	46.5	54	15.8	143.68	− 0.05	0.006 1103	+27.9	19	21	16.11
2	153	70	52	14.4	51	43.6	143.65	+ 0.07	0.006 1766	27.3	19	17	20.20
3	154	71	49	41.6	49	10.6	143.62	0.20	0.006 2414	26.7	19	13	24.29
4	155	72	47	8.1	46	36.9	143.59	+ 0.32	0.006 3045	+26.0	19	9	28.38
5	156	73	44	34.0	44	2.6	143.56	0.44	0.006 3659	25.2	19	5	32.46
6	157	74	41	59.2	41	27.6	143.54	0.54	0.006 4253	24.3	19	1	36.55
7	158	75	39	23.8	38	52.0	143.51	+ 0.62	0.006 4826	+23.4	18	57	40.64
8	159	76	36	47.7	36	15.8	143.48	0.68	0.006 5378	22.5	18	53	44.73
9	160	77	34	11.0	33	38.9	143.46	0.71	0.006 5908	21.6	18	49	48.81
10	161	78	31	33.7	31	1.4	143.43	+ 0.73	0.006 6415	+20.6	18	45	52.90
11	162	79	28	55.7	28	23.2	143.41	0.71	0.006 6898	19.6	18	41	56.99
12	163	80	26	17.0	25	44.3	143.38	0.65	0.006 7356	18.6	18	38	1.08
13	164	81	23	37.7	23	4.8	143.35	+ 0.58	0.006 7789	+17.6	18	34	5.16
14	165	82	20	57.6	20	24.6	143.32	0.49	0.006 8198	16.5	18	30	9.25
15	166	83	18	16.8	17	43.6	143.29	0.38	0.006 8583	15.5	18	26	13.34
16	167	84	15	35.3	15	1.8	143.25	+ 0.25	0.006 8943	+14.5	18	22	17.43
17	168	85	12	53.0	12	19.4	143.22	+ 0.11	0.006 9279	13.5	18	18	21.52
18	169	86	10	10.0	9	36.1	143.19	− 0.02	0.006 9592	12.6	18	14	25.60
19	170	87	7	26.1	6	52.1	143.16	− 0.15	0.006 9883	+11.7	18	10	29.69
20	171	88	4	41.5	4	7.3	143.13	0.25	0.007 0152	10.8	18	6	33.78
21	172	89	1	56.2	1	21.8	143.10	0.34	0.007 0401	10.0	18	2	37.86
22	173	89	59	10.1	58	35.5	143.07	− 0.42	0.007 0631	+ 9.2	17	58	41.95
23	174	90	56	23.3	55	48.6	143.04	0.45	0.007 0844	8.5	17	54	46.04
24	175	91	53	36.0	53	1.0	143.02	0.44	0.007 1041	7.9	17	50	50.13
25	176	92	50	48.1	50	12.9	143.00	− 0.40	0.007 1223	+ 7.3	17	46	54.21
26	177	93	47	59.7	47	24.4	142.98	0.34	0.007 1391	6.7	17	42	58.30
27	178	94	45	11.1	44	35.6	142.97	0.25	0.007 1545	6.1	17	39	2.39
28	179	95	42	22.2	41	46.5	142.96	− 0.14	0.007 1686	+ 5.6	17	35	6.48
29	180	96	39	33.3	38	57.4	142.96	0.00	0.007 1812	5.0	17	31	10.56
30	181	97	36	44.3	36	8.2	142.96	+ 0.14	0.007 1924	4.3	17	27	14.65
31	182	98	33	55.4	33	19.2	142.97	+ 0.26	0.007 2019	+ 3.6	17	23	18.74
NOTE.—The longitudes in the column $\lambda$ are referred to the true equinox of their own date, while those in the column $\lambda'$ are referred to the mean equinox of the beginning of the Besselian fictitious year.										Diff. for 1 Hour. − 9 <sup>h</sup> .3296. (Table II.)			

GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S								
	SEMI- DIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	16 12.0	16 4.3	59 21.51	−2.307	58 53.30	−2.385	16 10.8	2.21	18.4
2	15 56.5	15 48.6	58 24.48	2.409	57 55.67	2.384	17 1.1	2.00	19.4
3	15 40.9	15 33.5	57 27.41	2.320	57 0.14	2.221	17 47.0	1.85	20.4
4	15 26.4	15 19.8	56 34.22	−2.095	56 9.95	−1.946	18 30.0	1.75	21.4
5	15 13.7	15 8.2	55 47.56	1.783	55 27.19	1.610	19 11.4	1.71	22.4
6	15 3.2	14 58.8	55 8.93	1.433	54 52.81	1.254	19 52.6	1.72	23.4
7	14 55.0	14 51.8	54 38.84	−1.076	54 26.98	−0.903	20 34.6	1.78	24.4
8	14 49.1	14 47.0	54 17.19	0.733	54 9.39	0.572	21 18.3	1.87	25.4
9	14 45.4	14 44.2	54 3.47	0.419	53 59.34	0.274	22 4.3	1.97	26.4
10	14 43.6	14 43.4	53 56.91	−0.136	53 56.08	−0.005	22 52.8	2.06	27.4
11	14 43.5	14 44.1	53 56.76	+0.117	53 58.86	+0.232	23 43.2	2.13	28.4
12	14 45.0	14 46.4	54 2.32	0.344	54 7.10	0.451	0	.	29.4
13	14 48.0	14 50.0	54 13.15	+0.556	54 20.45	+0.660	0 34.7	2.15	0.7
14	14 52.3	14 55.0	54 28.99	0.764	54 38.78	0.869	1 25.9	2.11	1.7
15	14 58.0	15 1.4	54 49.84	0.975	55 2.19	1.084	2 15.9	2.05	2.7
16	15 5.1	15 9.2	55 15.86	+1.195	55 30.88	+1.309	3 3.9	1.96	3.7
17	15 13.6	15 18.5	55 47.27	1.423	56 5.04	1.537	3 50.0	1.89	4.7
18	15 23.7	15 29.3	56 24.15	1.647	56 44.55	1.751	4 34.7	1.85	5.7
19	15 35.1	15 41.3	57 6.14	+1.844	57 28.76	+1.923	5 19.0	1.85	6.7
20	15 47.7	15 54.2	57 52.20	1.981	58 16.20	2.014	6 3.9	1.91	7.7
21	16 0.8	16 7.4	58 40.40	2.014	59 4.39	1.978	6 51.1	2.03	8.7
22	16 13.7	16 19.7	59 27.71	+1.901	59 49.82	+1.775	7 41.8	2.20	9.7
23	16 25.3	16 30.1	60 10.11	1.598	60 27.98	1.373	8 37.4	2.43	10.7
24	16 34.2	16 37.3	60 42.88	1.102	60 54.26	0.788	9 38.5	2.65	11.7
25	16 39.3	16 40.1	61 1.65	+0.438	61 4.68	+0.064	10 43.9	2.78	12.7
26	16 39.7	16 38.0	61 3.14	−0.320	60 57.01	−0.699	11 50.9	2.77	13.7
27	16 35.2	16 31.1	60 46.43	1.061	60 31.65	1.396	12 55.8	2.61	14.7
28	16 26.1	16 20.1	60 13.08	−1.691	59 51.26	−1.936	13 55.8	2.38	15.7
29	16 13.5	16 6.3	59 26.84	2.125	59 0.49	2.258	14 50.1	2.15	16.7
30	15 58.8	15 51.1	58 32.86	2.337	58 4.60	2.363	15 39.4	1.96	17.7
31	15 43.4	15 35.8	57 36.33	−2.341	57 8.59	−2.275	16 24.7	1.83	18.7





JUNE, 1915.

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MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## MEAN TIME.

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JUNE, 1915.

MEAN TIME.

THE MOON'S RIGHT ~~ASCENSION~~ AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT                      AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GR

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.



AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Added to Apparent Time.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.		
		h m s	s	° ' "	"	' "	s	m s
Thur.	1	6 37 16.82	10.347	N.23 10 31.5	- 9.21	15 45.69	68.78	3 26.38
Fri.	2	6 41 25.05	10.338	23 6 38.3	10.22	15 45.67	68.75	3 38.02
Sat.	3	6 45 33.04	10.328	23 2 20.8	11.23	15 45.66	68.71	3 49.43
SUN.	4	6 49 40.78	10.316	22 57 39.2	-12.24	15 45.65	68.67	4 0.57
Mon.	5	6 53 48.23	10.304	22 52 33.4	13.24	15 45.64	68.63	4 11.44
Tues.	6	6 57 55.38	10.291	22 47 3.8	14.23	15 45.64	68.58	4 22.00
Wed.	7	7 2 2.21	10.277	22 41 10.3	-15.22	15 45.65	68.53	4 32.24
Thur.	8	7 6 8.69	10.262	22 34 53.1	16.20	15 45.66	68.48	4 42.14
Fri.	9	7 10 14.81	10.247	22 28 12.4	17.18	15 45.68	68.42	4 51.67
Sat.	10	7 14 20.54	10.230	22 21 8.4	-18.15	15 45.70	68.36	5 0.82
SUN.	11	7 18 25.86	10.213	22 13 41.2	19.11	15 45.72	68.30	5 9.56
Mon.	12	7 22 30.75	10.195	22 5 51.0	20.07	15 45.75	68.24	5 17.87
Tues.	13	7 26 35.20	10.176	21 57 37.9	-21.01	15 45.79	68.17	5 25.74
Wed.	14	7 30 39.18	10.156	21 49 2.3	21.95	15 45.84	68.11	5 33.14
Thur.	15	7 34 42.68	10.135	21 40 4.3	22.88	15 45.89	68.04	5 40.06
Fri.	16	7 38 45.67	10.114	21 30 44.1	-23.80	15 45.94	67.97	5 46.48
Sat.	17	7 42 48.14	10.092	21 21 2.0	24.71	15 46.00	67.90	5 52.37
SUN.	18	7 46 50.08	10.069	21 10 58.1	25.61	15 46.06	67.83	5 57.74
Mon.	19	7 50 51.47	10.046	21 0 32.9	-26.50	15 46.13	67.76	6 2.56
Tues.	20	7 54 52.30	10.023	20 49 46.3	27.38	15 46.21	67.69	6 6.82
Wed.	21	7 58 52.56	9.999	20 38 38.8	28.24	15 46.29	67.61	6 10.52
Thur.	22	8 2 52.25	9.975	20 27 10.6	-29.10	15 46.37	67.53	6 13.64
Fri.	23	8 6 51.34	9.950	20 15 21.9	29.95	15 46.46	67.45	6 16.17
Sat.	24	8 10 49.85	9.926	20 3 12.9	30.79	15 46.55	67.37	6 18.12
SUN.	25	8 14 47.78	9.901	19 50 43.9	-31.62	15 46.64	67.28	6 19.48
Mon.	26	8 18 45.10	9.877	19 37 55.2	32.44	15 46.73	67.20	6 20.25
Tues.	27	8 22 41.84	9.852	19 24 46.9	33.25	15 46.83	67.11	6 20.43
Wed.	28	8 26 37.98	9.827	19 11 19.2	-34.05	15 46.93	67.03	6 20.01
Thur.	29	8 30 33.54	9.802	18 57 32.6	34.84	15 47.03	66.94	6 19.01
Fri.	30	8 34 28.50	9.778	18 43 27.2	35.61	15 47.14	66.85	6 17.42
Sat.	31	8 38 22.87	9.753	18 29 3.2	36.38	15 47.25	66.76	6 15.24
SUN.	32	8 42 16.66	9.728	N.18 14 20.9	-37.14	15 47.36	66.68	6 12.48

NORR.—The mean time of semidiameter passing the meridian may be found by subtracting 0.19 from the time.  
The sign — prefixed to the hourly change of declination indicates that north declinations are decreas

AT GREENWICH MEAN NOON.

Day of the Week.	Day of the Month.	THE SUN'S				Equation of Time, to be Subtracted from Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
		h m s	s	° ' "	"	m s	s	h m s
Thur.	1	6 37 16.23	10.346	N. 23 10 32.0	− 9.21	3 26.36	0.489	6 33 49.87
Fri.	2	6 41 24.42	10.337	23 6 38.9	10.22	3 38.00	0.480	6 37 46.43
Sat.	3	6 45 32.38	10.326	23 2 21.5	11.23	3 49.40	0.470	6 41 42.99
SUN.	4	6 49 40.09	10.315	22 57 40.0	−12.23	4 0.54	0.459	6 45 39.55
Mon.	5	6 53 47.51	10.303	22 52 34.4	13.23	4 11.41	0.446	6 49 36.10
Tues.	6	6 57 54.64	10.290	22 47 4.8	14.23	4 21.97	0.433	6 53 32.66
Wed.	7	7 2 1.43	10.276	22 41 11.4	−15.22	4 32.21	0.419	6 57 29.22
Thur.	8	7 6 7.89	10.261	22 34 54.4	16.20	4 42.11	0.405	7 1 25.78
Fri.	9	7 10 13.98	10.246	22 28 13.8	17.18	4 51.64	0.389	7 5 22.34
Sat.	10	7 14 19.68	10.229	22 21 9.9	−18.15	5 0.78	0.372	7 9 18.90
SUN.	11	7 18 24.98	10.212	22 13 42.9	19.11	5 9.53	0.355	7 13 15.45
Mon.	12	7 22 29.85	10.194	22 5 52.8	20.06	5 17.84	0.337	7 17 12.01
Tues.	13	7 26 34.28	10.175	21 57 39.8	−21.01	5 25.71	0.318	7 21 8.57
Wed.	14	7 30 38.24	10.155	21 49 4.3	21.95	5 33.11	0.298	7 25 5.13
Thur.	15	7 34 41.72	10.134	21 40 6.4	22.87	5 40.03	0.278	7 29 1.69
Fri.	16	7 38 44.69	10.113	21 30 46.4	−23.79	5 46.45	0.257	7 32 58.24
Sat.	17	7 42 47.15	10.091	21 21 4.4	24.70	5 52.35	0.235	7 36 54.80
SUN.	18	7 46 49.08	10.069	21 11 0.7	25.60	5 57.72	0.212	7 40 51.36
Mon.	19	7 50 50.46	10.046	21 0 35.5	−26.49	6 2.54	0.189	7 44 47.92
Tues.	20	7 54 51.28	10.022	20 49 49.1	27.37	6 6.80	0.166	7 48 44.47
Wed.	21	7 58 51.53	9.998	20 38 41.7	28.24	6 10.50	0.142	7 52 41.03
Thur.	22	8 2 51.21	9.974	20 27 13.6	−29.10	6 13.62	0.118	7 56 37.59
Fri.	23	8 6 50.30	9.950	20 15 25.0	29.95	6 16.16	0.093	8 0 34.14
Sat.	24	8 10 48.81	9.926	20 3 16.1	30.79	6 18.11	0.069	8 4 30.70
SUN.	25	8 14 46.73	9.901	19 50 47.2	−31.62	6 19.47	0.044	8 8 27.26
Mon.	26	8 18 44.06	9.876	19 37 58.6	32.44	6 20.24	0.020	8 12 23.82
Tues.	27	8 22 40.80	9.852	19 24 50.4	33.24	6 20.43	0.005	8 16 20.37
Wed.	28	8 26 36.95	9.827	19 11 22.8	−34.04	6 20.02	0.029	8 20 16.93
Thur.	29	8 30 32.50	9.803	18 57 36.3	34.83	6 19.02	0.054	8 24 13.49
Fri.	30	8 34 27.47	9.778	18 43 30.9	35.61	6 17.43	0.078	8 28 10.04
Sat.	31	8 38 21.86	9.754	18 29 7.0	36.38	6 15.25	0.103	8 32 6.60
SUN.	32	8 42 15.65	9.729	N. 18 14 24.8	−37.14	6 12.49	0.127	8 36 3.16

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign − prefixed to the hourly change of declination indicates that north declinations are decreasing.

Diff. for 1 Hour,  
+9.8565.  
(Table III.)



GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S								
	SEMI- DIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 43.4	15 35.8	57 36.33	-2.341	57 8.59	-2.275	16 24.7	1.83	18.7
2	15 28.5	15 21.6	56 41.87	2.173	56 16.57	2.039	17 7.7	1.76	19.7
3	15 15.2	15 9.3	55 53.02	1.882	55 31.47	1.706	17 49.7	1.75	20.7
4	15 4.1	14 59.4	55 12.12	-1.517	54 55.09	-1.320	18 31.9	1.78	21.7
5	14 55.4	14 52.1	54 40.46	1.118	54 28.26	0.916	19 15.3	1.85	22.7
6	14 49.5	14 47.4	54 18.48	0.715	54 11.08	0.519	20 0.7	1.94	23.7
7	14 46.0	14 45.3	54 5.99	-0.331	54 3.10	-0.152	20 48.4	2.04	24.7
8	14 45.0	14 45.4	54 2.30	+0.017	54 3.45	+0.173	21 38.3	2.11	25.7
9	14 46.2	14 47.4	54 6.41	0.318	54 11.03	0.451	22 29.7	2.15	26.7
10	14 49.1	14 51.2	54 17.18	+0.572	54 24.71	+0.681	23 21.4	2.15	27.7
11	14 53.5	14 56.2	54 33.48	0.778	54 43.35	0.865	0	.	28.7
12	14 59.2	15 2.4	54 54.21	0.943	55 5.95	1.012	0 12.3	2.08	0.1
13	15 5.8	15 9.4	55 18.48	+1.075	55 31.73	+1.133	1 1.3	2.00	1.1
14	15 13.2	15 17.2	55 45.65	1.186	56 0.18	1.235	1 48.4	1.92	2.1
15	15 21.3	15 25.6	56 15.29	1.282	56 30.95	1.328	2 33.7	1.86	3.1
16	15 30.0	15 34.5	56 47.15	+1.372	57 3.86	+1.412	3 18.0	1.84	4.1
17	15 39.2	15 44.0	57 21.01	1.445	57 38.52	1.472	4 2.3	1.86	5.1
18	15 48.8	15 53.7	57 56.30	1.490	58 14.23	1.496	4 47.8	1.94	6.1
19	15 58.6	16 3.4	58 32.14	+1.486	58 49.81	+1.454	5 36.0	2.08	7.1
20	16 8.1	16 12.5	59 6.94	1.396	59 23.21	1.310	6 28.0	2.27	8.1
21	16 16.6	16 20.2	59 38.26	1.192	59 51.70	1.042	7 25.0	2.48	9.1
22	16 23.4	16 25.8	60 3.14	+0.859	60 12.18	+0.642	8 26.6	2.65	10.1
23	16 27.5	16 28.4	60 18.42	+0.393	60 21.51	+0.119	9 31.5	2.72	11.1
24	16 28.3	16 27.3	60 21.22	-0.170	60 17.40	-0.467	10 36.4	2.66	12.1
25	16 25.2	16 22.3	60 10.01	-0.764	59 59.10	-1.051	11 38.3	2.49	13.1
26	16 18.4	16 13.7	59 44.86	1.318	59 27.59	1.555	12 35.5	2.28	14.1
27	16 8.3	16 2.2	59 7.68	1.756	58 45.62	1.914	13 27.6	2.08	15.1
28	15 55.8	15 49.0	58 21.93	-2.027	57 57.16	-2.094	14 15.5	1.93	16.1
29	15 42.2	15 35.2	57 31.85	2.116	57 6.54	2.095	15 0.5	1.83	17.1
30	15 28.5	15 22.0	56 41.72	2.035	56 17.84	1.939	15 43.8	1.79	18.1
31	15 15.8	15 10.2	55 55.30	1.813	55 34.43	1.661	16 26.7	1.80	19.1
32	15 5.0	15 0.4	55 15.52	-1.488	54 58.79	-1.298	17 10.3	1.84	20.1

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MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.



MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

	Declination.			Diff. for 1 Min.
DAY 15.				
N.	11	24	34.6	13.661
	11	10	53.2	13.718
	10	57	8.4	13.776
	10	43	20.1	13.833
	10	29	28.5	13.888
	10	15	33.6	13.943
	10	1	35.4	13.997
	9	47	34.0	14.049
	9	33	29.5	14.101
	9	19	21.9	14.152
	9	5	11.3	14.201
	8	50	57.8	14.249
	8	36	41.4	14.298
	8	22	22.1	14.344
	8	8	0.1	14.390
	7	53	35.3	14.435
	7	39	7.9	14.478
	7	24	37.9	14.522
	7	10	5.3	14.564
	6	55	30.2	14.605
	6	40	52.7	14.644
	6	26	12.9	14.683
	6	11	30.8	14.721
N.	5	56	46.4	14.758
DAY 16.				
N.	5	41	59.9	14.793
	5	27	11.2	14.828
	5	12	20.5	14.862
	4	57	27.8	14.895
	4	42	33.1	14.928
	4	27	36.5	14.958
	4	12	38.1	14.988
	3	57	38.0	15.017
	3	42	36.1	15.045
	3	27	32.6	15.072
	3	12	27.5	15.098
	2	57	20.9	15.123
	2	42	12.8	15.146
	2	27	3.4	15.168
	2	11	52.6	15.190
	1	56	40.6	15.211
	1	41	27.3	15.231
	1	26	12.9	15.249
	1	10	57.4	15.267
	0	55	40.9	15.283
	0	40	23.5	15.298
	0	25	5.2	15.313
N.	0	9	46.0	15.326
S.	0	5	33.9	15.338
S.	0	20	54.5	15.348



MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
WEDNESDAY 21.					FRIDAY 23.				
0	15 0 13.25	2.4855	S. 22 32 13.6	10.038	0	17 7 13.40	2.7604	S. 27 25 33.1	1.628
1	15 2 42.62	2.4933	22 42 11.8	9.902	1	17 9 59.09	2.7625	27 27 4.7	1.424
2	15 5 12.45	2.5011	22 52 1.8	9.763	2	17 12 44.90	2.7643	27 28 24.0	1.219
3	15 7 42.75	2.5088	23 1 43.3	9.622	3	17 15 30.81	2.7659	27 29 31.0	1.014
4	15 10 13.51	2.5165	23 11 16.4	9.479	4	17 18 16.81	2.7673	27 30 25.7	0.810
5	15 12 44.73	2.5242	23 20 40.8	9.334	5	17 21 2.89	2.7686	27 31 8.2	0.605
6	15 15 16.41	2.5318	23 29 56.5	9.188	6	17 23 49.04	2.7696	27 31 38.3	0.398
7	15 17 48.55	2.5394	23 39 3.4	9.040	7	17 26 35.24	2.7704	27 31 56.0	-0.193
8	15 20 21.14	2.5470	23 48 1.3	8.890	8	17 29 21.49	2.7711	27 32 1.4	+0.013
9	15 22 54.19	2.5545	23 56 50.2	8.738	9	17 32 7.77	2.7714	27 31 54.5	0.218
10	15 25 27.68	2.5618	24 5 29.9	8.584	10	17 34 54.06	2.7716	27 31 35.2	0.425
11	15 28 1.61	2.5692	24 14 0.3	8.429	11	17 37 40.36	2.7716	27 31 3.5	0.632
12	15 30 35.98	2.5765	24 22 21.4	8.272	12	17 40 26.65	2.7713	27 30 19.4	0.838
13	15 33 10.79	2.5838	24 30 32.9	8.113	13	17 43 12.92	2.7709	27 29 23.0	1.043
14	15 35 46.03	2.5909	24 38 34.9	7.953	14	17 45 59.16	2.7703	27 28 14.2	1.250
15	15 38 21.70	2.5980	24 46 27.2	7.790	15	17 48 45.36	2.7694	27 26 53.0	1.456
16	15 40 57.79	2.6049	24 54 9.7	7.625	16	17 51 31.49	2.7683	27 25 19.5	1.661
17	15 43 34.29	2.6118	25 1 42.2	7.459	17	17 54 17.55	2.7670	27 23 33.7	1.866
18	15 46 11.21	2.6187	25 9 4.8	7.293	18	17 57 3.53	2.7655	27 21 35.6	2.071
19	15 48 48.53	2.6253	25 16 17.3	7.123	19	17 59 49.41	2.7638	27 19 25.2	2.275
20	15 51 26.25	2.6320	25 23 19.5	6.953	20	18 2 35.19	2.7620	27 17 2.6	2.478
21	15 54 4.37	2.6386	25 30 11.5	6.780	21	18 5 20.85	2.7598	27 14 27.8	2.682
22	15 56 42.88	2.6449	25 36 53.1	6.606	22	18 8 6.37	2.7575	27 11 40.8	2.884
23	15 59 21.76	2.6512	S. 25 43 24.2	6.430	23	18 10 51.75	2.7551	S. 27 8 41.7	3.087
THURSDAY 22.					SATURDAY 24.				
0	16 2 1.02	2.6574	S. 25 49 44.7	6.253	0	18 13 36.98	2.7523	S. 27 5 30.4	3.288
1	16 4 40.65	2.6635	25 55 54.5	6.074	1	18 16 22.03	2.7494	27 2 7.1	3.489
2	16 7 20.64	2.6694	26 1 53.6	5.894	2	18 19 6.91	2.7464	26 58 31.7	3.690
3	16 10 0.98	2.6752	26 7 41.8	5.712	3	18 21 51.60	2.7431	26 54 44.3	3.888
4	16 12 41.66	2.6808	26 13 19.0	5.529	4	18 24 36.08	2.7396	26 50 45.1	4.086
5	16 15 22.68	2.6864	26 18 45.3	5.345	5	18 27 20.35	2.7359	26 46 34.0	4.283
6	16 18 4.03	2.6918	26 24 0.4	5.158	6	18 30 4.39	2.7321	26 42 11.1	4.480
7	16 20 45.70	2.6970	26 29 4.3	4.972	7	18 32 48.20	2.7282	26 37 36.4	4.675
8	16 23 27.67	2.7021	26 33 57.0	4.783	8	18 35 31.77	2.7240	26 32 50.1	4.868
9	16 26 9.95	2.7071	26 38 38.3	4.593	9	18 38 15.08	2.7196	26 27 52.2	5.062
10	16 28 52.52	2.7118	26 43 8.2	4.403	10	18 40 58.12	2.7150	26 22 42.7	5.254
11	16 31 35.37	2.7164	26 47 26.7	4.212	11	18 43 40.88	2.7103	26 17 21.7	5.444
12	16 34 18.49	2.7209	26 51 33.6	4.018	12	18 46 23.36	2.7053	26 11 49.4	5.633
13	16 37 1.88	2.7253	26 55 28.8	3.823	13	18 49 5.54	2.7004	26 6 5.7	5.822
14	16 39 45.52	2.7293	26 59 12.4	3.628	14	18 51 47.41	2.6953	26 0 10.8	6.008
15	16 42 29.40	2.7333	27 2 44.2	3.432	15	18 54 28.97	2.6900	25 54 4.8	6.193
16	16 45 13.51	2.7370	27 6 4.2	3.235	16	18 57 10.21	2.6845	25 47 47.6	6.378
17	16 47 57.84	2.7406	27 9 12.4	3.037	17	18 59 51.11	2.6788	25 41 19.5	6.559
18	16 50 42.38	2.7440	27 12 8.6	2.838	18	19 2 31.67	2.6731	25 34 40.5	6.740
19	16 53 27.12	2.7473	27 14 52.9	2.638	19	19 5 11.88	2.6672	25 27 50.7	6.919
20	16 56 12.05	2.7503	27 17 25.1	2.437	20	19 7 51.73	2.6612	25 20 50.2	7.098
21	16 58 57.15	2.7531	27 19 45.3	2.236	21	19 10 31.22	2.6551	25 13 39.0	7.274
22	17 1 42.42	2.7558	27 21 53.4	2.034	22	19 13 10.34	2.6488	25 6 17.3	7.448
23	17 4 27.84	2.7582	27 23 49.4	1.831	23	19 15 49.07	2.6423	24 58 45.2	7.622
24	17 7 13.40	2.7604	S. 27 25 33.1	1.628	24	19 18 27.42	2.6358	S. 24 51 2.7	7.793

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
THURSDAY 29.					SATURDAY 31.				
0	22 57 42.02	1.9889	S. 4 4 1.6	15.338	0	0 30 15.46	1.8983	N. 7 50 26.4	14.063
1	22 59 41.24	1.9851	3 48 41.4	15.336	1	0 32 9.36	1.8983	8 4 28.7	14.014
2	23 1 40.23	1.9813	3 33 21.3	15.333	2	0 34 3.26	1.8984	8 18 28.1	13.965
3	23 3 39.00	1.9777	3 18 1.4	15.328	3	0 35 57.17	1.8985	8 32 24.5	13.915
4	23 5 37.55	1.9741	3 2 41.9	15.323	4	0 37 51.08	1.8987	8 46 17.9	13.865
5	23 7 35.89	1.9707	2 47 22.7	15.316	5	0 39 45.01	1.8990	9 0 8.3	13.813
6	23 9 34.03	1.9673	2 32 4.0	15.308	6	0 41 38.96	1.8993	9 13 55.5	13.761
7	23 11 31.97	1.9640	2 16 45.8	15.298	7	0 43 32.93	1.8998	9 27 39.6	13.708
8	23 13 29.71	1.9608	2 1 28.2	15.288	8	0 45 26.93	1.9003	9 41 20.5	13.654
9	23 15 27.26	1.9577	1 46 11.3	15.276	9	0 47 20.96	1.9008	9 54 58.1	13.600
10	23 17 24.63	1.9546	1 30 55.1	15.263	10	0 49 15.03	1.9014	10 8 32.5	13.545
11	23 19 21.81	1.9516	1 15 39.7	15.249	11	0 51 9.13	1.9021	10 22 3.5	13.489
12	23 21 18.82	1.9488	1 0 25.2	15.234	12	0 53 3.28	1.9029	10 35 31.2	13.433
13	23 23 15.66	1.9460	0 45 11.6	15.219	13	0 54 57.48	1.9037	10 48 55.5	13.376
14	23 25 12.34	1.9433	0 29 58.9	15.203	14	0 56 51.72	1.9045	11 2 16.3	13.318
15	23 27 8.85	1.9406	S. 0 14 47.3	15.183	15	0 58 46.02	1.9055	11 15 33.6	13.258
16	23 29 5.21	1.9381	N. 0 0 23.1	15.164	16	1 0 40.38	1.9065	11 28 47.3	13.199
17	23 31 1.42	1.9356	0 15 32.4	15.145	17	1 2 34.80	1.9076	11 41 57.5	13.139
18	23 32 57.48	1.9332	0 30 40.5	15.124	18	1 4 29.29	1.9087	11 55 4.0	13.078
19	23 34 53.40	1.9309	0 45 47.3	15.102	19	1 6 23.84	1.9098	12 8 6.9	13.017
20	23 36 49.19	1.9288	1 0 52.7	15.078	20	1 8 18.47	1.9112	12 21 6.0	12.954
21	23 38 44.85	1.9266	1 15 56.7	15.055	21	1 10 13.18	1.9124	12 34 1.4	12.892
22	23 40 40.38	1.9245	1 30 59.3	15.030	22	1 12 7.96	1.9138	12 46 53.0	12.828
23	23 42 35.79	1.9225	N. 1 46 0.3	15.003	23	1 14 2.83	1.9153	N. 12 59 40.8	12.763
FRIDAY 30.					SUNDAY, AUGUST 1.				
0	23 44 31.08	1.9206	N. 2 0 59.7	14.977	0	1 15 57.79	1.9168	N. 13 12 24.6	12.698
1	23 46 26.26	1.9188	2 15 57.5	14.948	PHASES OF THE MOON.				
2	23 48 21.34	1.9171	2 30 53.5	14.919					
3	23 50 16.31	1.9154	2 45 47.8	14.889	☾ Last Quarter . . . . . July d h m 3 17 54.2 ● New Moon . . . . . 11 21 30.8 ☾ First Quarter . . . . . 19 9 8.8 ○ Full Moon . . . . . 26 0 11.0				
4	23 52 11.19	1.9138	3 0 40.2	14.858					
5	23 54 5.97	1.9123	3 15 30.8	14.828	☾ Apogee . . . . . July d h 7 22.8 ☾ Perigee . . . . . 23 17.4				
6	23 56 0.67	1.9109	3 30 19.5	14.795					
7	23 57 55.28	1.9095	3 45 6.2	14.761					
8	23 59 49.81	1.9083	3 59 50.8	14.727					
9	0 1 44.27	1.9071	4 14 33.4	14.692					
10	0 3 38.66	1.9060	4 29 13.8	14.655					
11	0 5 32.99	1.9050	4 43 52.0	14.618					
12	0 7 27.26	1.9040	4 58 28.0	14.581					
13	0 9 21.47	1.9031	5 13 1.7	14.542					
14	0 11 15.63	1.9023	5 27 33.0	14.502					
15	0 13 9.75	1.9017	5 42 1.9	14.462					
16	0 15 3.83	1.9010	5 56 28.4	14.421					
17	0 16 57.87	1.9003	6 10 52.4	14.379					
18	0 18 51.87	1.8998	6 25 13.9	14.336					
19	0 20 45.85	1.8994	6 39 32.7	14.292					
20	0 22 39.80	1.8990	6 53 48.9	14.248					
21	0 24 33.73	1.8988	7 8 2.4	14.203					
22	0 26 27.65	1.8986	7 22 13.2	14.157					
23	0 28 21.56	1.8984	7 36 21.2	14.110					
24	0 30 15.46	1.8983	N. 7 50 26.4	14.063					

**NOTE.**—The mean time of semidiameter passing the meridian may be found by subtracting 0<sup>s</sup>.19 from the time.

The sign — prefixed to the hourly change of declination indicates that north declinations are decreasing.

## AT GREENWICH MEAN NOON.

Day of the Month.	THE SUN'S				Equation of Time, to be Subtracted from Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
	Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
	h m s	s	° ' "	"	m s	s	h m s
1	8 42 15.65	9.729	N. 18 14 24.8	-37.14	6 12.49	0.127	8 36 3.16
2	8 46 8.85	9.705	17 59 24.6	37.88	6 9.14	0.152	8 39 59.72
3	8 50 1.47	9.680	17 44 6.6	38.61	6 5.20	0.176	8 43 56.27
4	8 53 53.50	9.656	17 28 31.3	-39.33	6 0.67	0.201	8 47 52.83
5	8 57 44.94	9.631	17 12 38.8	40.04	5 55.56	0.225	8 51 49.38
6	9 1 35.80	9.607	16 56 29.5	40.73	5 49.86	0.250	8 55 45.94
7	9 5 26.07	9.583	16 40 3.7	-41.41	5 43.58	0.274	8 59 42.50
8	9 9 15.76	9.558	16 23 21.6	42.08	5 36.71	0.298	9 3 39.05
9	9 13 4.87	9.534	16 6 23.6	42.74	5 29.27	0.322	9 7 35.61
10	9 16 53.40	9.510	15 49 10.0	-43.38	5 21.24	0.346	9 11 32.16
11	9 20 41.35	9.486	15 31 41.2	44.01	5 12.63	0.370	9 15 28.72
12	9 24 28.74	9.462	15 13 57.5	44.63	5 3.46	0.394	9 19 25.28
13	9 28 15.54	9.439	14 55 59.1	-45.23	4 53.71	0.418	9 23 21.83
14	9 32 1.79	9.415	14 37 46.5	45.81	4 43.40	0.441	9 27 18.39
15	9 35 47.47	9.392	14 19 20.0	46.38	4 32.53	0.465	9 31 14.94
16	9 39 32.60	9.369	14 0 40.0	-46.94	4 21.10	0.488	9 35 11.50
17	9 43 17.18	9.346	13 41 46.6	47.49	4 9.13	0.510	9 39 8.05
18	9 47 1.22	9.324	13 22 40.3	48.02	3 56.62	0.532	9 43 4.61
19	9 50 44.74	9.302	13 3 21.4	-48.54	3 43.58	0.554	9 47 1.16
20	9 54 27.74	9.281	12 43 50.3	49.05	3 30.02	0.575	9 50 57.72
21	9 58 10.24	9.261	12 24 7.1	49.54	3 15.97	0.596	9 54 54.27
22	10 1 52.25	9.241	12 4 12.2	-50.02	3 1.43	0.616	9 58 50.83
23	10 5 33.80	9.222	11 44 6.0	50.49	2 46.42	0.635	10 2 47.38
24	10 9 14.89	9.204	11 23 48.6	50.95	2 30.95	0.653	10 6 43.94
25	10 12 55.54	9.187	11 3 20.4	-51.40	2 15.05	0.671	10 10 40.49
26	10 16 35.78	9.169	10 42 41.6	51.83	1 58.74	0.688	10 14 37.05
27	10 20 15.62	9.152	10 21 52.6	52.24	1 42.02	0.704	10 18 33.60
28	10 23 55.08	9.136	10 0 53.7	-52.64	1 24.92	0.720	10 22 30.16
29	10 27 34.17	9.122	9 39 45.1	53.04	1 7.46	0.735	10 26 26.71
30	10 31 12.92	9.108	9 18 27.1	53.43	0 49.66	0.749	10 30 23.26
31	10 34 51.34	9.094	8 57 0.2	53.80	0 31.52	0.762	10 34 19.82
32	10 38 29.45	9.081	N. 8 35 24.5	-54.16	0 13.08	0.775	10 38 16.37

g.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign — prefixed to the hourly change of declination indicates that north declinations are decreasing.

Diff. for 1 Hour,  
+9°.8565.  
(Table III.)



GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 5.0	15 0.4	55 15.52	−1.488	54 58.79	−1.298	17 10.3	1.84	20.1
2	14 56.5	14 53.3	54 44.41	1.098	54 32.48	0.890	17 55.3	1.91	21.1
3	14 50.7	14 48.8	54 23.08	0.676	54 16.26	0.461	18 42.4	2.01	22.1
4	14 47.7	14 47.2	54 12.00	−0.250	54 10.24	−0.045	19 31.7	2.09	23.1
5	14 47.4	14 48.2	54 10.89	+0.152	54 13.86	+0.340	20 22.6	2.15	24.1
6	14 49.6	14 51.6	54 19.01	0.515	54 26.17	0.676	21 14.4	2.16	25.1
7	14 54.0	14 56.9	54 35.17	+0.821	54 45.81	+0.949	22 5.8	2.12	26.1
8	15 0.2	15 3.8	54 57.87	1.058	55 11.12	1.147	22 55.9	2.05	27.1
9	15 7.7	15 11.7	55 25.33	1.218	55 40.27	1.269	23 44.2	1.98	28.1
10	15 16.0	15 20.2	55 55.72	+1.303	56 11.48	+1.321	0	.	29.1
11	15 24.6	15 28.9	56 27.35	1.322	56 43.14	1.308	0 30.7	1.91	0.5
12	15 33.1	15 37.2	56 58.70	1.283	57 13.90	1.248	1 16.0	1.88	1.5
13	15 41.3	15 45.1	57 28.63	+1.205	57 42.80	+1.157	2 0.9	1.88	2.5
14	15 48.8	15 52.4	57 56.38	1.106	58 9.32	1.050	2 46.4	1.92	3.5
15	15 55.7	15 58.8	58 21.58	0.992	58 33.13	0.933	3 33.8	2.03	4.5
16	16 1.8	16 4.5	58 43.95	+0.869	58 53.97	+0.800	4 24.4	2.19	5.5
17	16 7.0	16 9.2	59 3.12	0.724	59 11.31	0.639	5 18.9	2.37	6.5
18	16 11.2	16 12.8	59 18.42	0.544	59 24.32	0.437	6 17.8	2.53	7.5
19	16 14.0	16 14.8	59 28.85	+0.315	59 31.81	+0.176	7 19.9	2.62	8.5
20	16 15.2	16 15.0	59 33.03	+0.025	59 32.35	−0.141	8 23.1	2.60	9.5
21	16 14.2	16 12.9	59 29.60	−0.320	59 24.63	0.509	9 24.6	2.50	10.5
22	16 10.9	16 8.3	59 17.37	−0.700	59 7.83	−0.890	10 22.5	2.32	11.5
23	16 5.1	16 1.3	58 56.03	1.075	58 42.08	1.248	11 15.9	2.14	12.5
24	15 57.0	15 52.1	58 26.16	1.402	58 8.53	1.532	12 5.3	1.98	13.5
25	15 47.0	15 41.5	57 49.50	−1.636	57 29.39	−1.711	12 51.6	1.88	14.5
26	15 35.8	15 30.1	57 8.58	1.751	56 47.50	1.757	13 36.0	1.82	15.5
27	15 24.4	15 18.8	56 26.54	1.731	56 6.08	1.674	14 19.6	1.82	16.5
28	15 13.4	15 8.4	55 46.49	−1.587	55 28.11	−1.472	15 3.5	1.85	17.5
29	15 3.8	14 59.8	55 11.27	1.331	54 56.25	1.170	15 48.5	1.90	18.5
30	14 56.2	14 53.3	54 43.26	0.992	54 32.50	0.799	16 35.2	1.98	19.5
31	14 51.0	14 49.4	54 24.13	0.594	54 18.27	−0.381	17 23.8	2.06	20.5
2	14 48.5	14 48.3	54 14.99	−0.165	54 14.30	+0.050	18 14.1	2.12	21.5



MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
TUESDAY 17.				
0	14 46 4 56	2.4038	S. 21 34 16.4	10.611
1	14 48 28.93	2.4096	21 44 49.3	10.484
2	14 50 53.71	2.4164	21 55 14.5	10.356
3	14 53 18.90	2.4232	22 5 32.0	10.228
4	14 55 44.49	2.4299	22 15 41.8	10.097
5	14 58 10.49	2.4367	22 25 43.6	9.963
6	15 0 36.89	2.4434	22 35 37.4	9.829
7	15 3 3.70	2.4502	22 45 23.1	9.694
8	15 5 30.91	2.4568	22 55 0.7	9.558
9	15 7 58.52	2.4635	23 4 30.0	9.418
10	15 10 26.53	2.4702	23 13 50.9	9.278
11	15 12 54.94	2.4768	23 23 3.3	9.135
12	15 15 23.74	2.4833	23 32 7.1	8.991
13	15 17 52.93	2.4898	23 41 2.2	8.846
14	15 20 22.52	2.4963	23 49 48.6	8.699
15	15 22 52.49	2.5028	23 58 26.1	8.551
16	15 25 22.85	2.5093	24 6 54.7	8.401
17	15 27 53.59	2.5155	24 15 14.2	8.249
18	15 30 24.71	2.5218	24 23 24.6	8.097
19	15 32 56.20	2.5279	24 31 25.8	7.942
20	15 35 28.06	2.5341	24 39 17.6	7.786
21	15 38 0.29	2.5402	24 47 0.1	7.628
22	15 40 32.88	2.5463	24 54 33.0	7.469
23	15 43 5.83	2.5521	S. 25 1 56.4	7.309
WEDNESDAY 18.				
0	15 45 39.13	2.5579	S. 25 9 10.1	7.148
1	15 48 12.78	2.5638	25 16 14.1	6.984
2	15 50 46.78	2.5694	25 23 8.2	6.819
3	15 53 21.11	2.5750	25 29 52.4	6.653
4	15 55 55.78	2.5806	25 36 26.6	6.486
5	15 58 30.78	2.5859	25 42 50.7	6.319
6	16 1 6.09	2.5912	25 49 4.7	6.148
7	16 3 41.72	2.5964	25 55 8.5	5.977
8	16 6 17.66	2.6015	26 1 1.9	5.804
9	16 8 53.90	2.6065	26 6 45.0	5.631
10	16 11 30.44	2.6113	26 12 17.6	5.456
11	16 14 7.26	2.6161	26 17 39.7	5.281
12	16 16 44.37	2.6208	26 22 51.3	5.104
13	16 19 21.76	2.6253	26 27 52.2	4.926
14	16 21 59.41	2.6297	26 32 42.4	4.747
15	16 24 37.32	2.6339	26 37 21.8	4.566
16	16 27 15.48	2.6380	26 41 50.3	4.384
17	16 29 53.88	2.6420	26 46 7.9	4.203
18	16 32 32.52	2.6459	26 50 14.6	4.020
19	16 35 11.39	2.6497	26 54 10.3	3.836
20	16 37 50.48	2.6533	26 57 54.9	3.651
21	16 40 29.78	2.6567	27 1 28.4	3.465
22	16 43 9.28	2.6599	27 4 50.7	3.278
23	16 45 48.97	2.6630	27 8 1.8	3.092
24	16 48 28.84	2.6660	S. 27 11 1.7	2.903
THURSDAY 19.				
0	16 48 28.84	2.6660	S. 27 11 1.7	2.903
1	16 51 8.89	2.6688	27 13 50.2	2.714
2	16 53 49.10	2.6715	27 16 27.4	2.525
3	16 56 29.47	2.6740	27 18 53.2	2.335
4	16 59 9.98	2.6763	27 21 7.6	2.145
5	17 1 50.63	2.6786	27 23 10.6	1.955
6	17 4 31.41	2.6806	27 25 2.0	1.765
7	17 7 12.30	2.6824	27 26 42.0	1.575
8	17 9 53.30	2.6841	27 28 10.4	1.385
9	17 12 34.39	2.6856	27 29 27.3	1.195
10	17 15 15.57	2.6869	27 30 32.6	0.999
11	17 17 56.82	2.6881	27 31 26.3	0.798
12	17 20 38.14	2.6891	27 32 8.3	0.593
13	17 23 19.51	2.6899	27 32 38.7	0.380
14	17 26 0.93	2.6906	27 32 57.5	0.166
15	17 28 42.38	2.6912	27 33 4.6	-0.041
16	17 31 23.86	2.6914	27 33 0.0	-0.233
17	17 34 5.35	2.6914	27 32 43.8	0.380
18	17 36 46.83	2.6913	27 32 15.9	0.584
19	17 39 28.31	2.6912	27 31 36.4	0.776
20	17 42 9.77	2.6908	27 30 45.2	0.950
21	17 44 51.20	2.6902	27 29 42.4	1.114
22	17 47 32.59	2.6894	27 28 27.9	1.268
23	17 50 13.93	2.6885	S. 27 27 1.8	1.413
FRIDAY 20.				
0	17 52 55.21	2.6874	S. 27 25 24.0	1.557
1	17 55 36.42	2.6862	27 23 34.6	1.709
2	17 58 17.55	2.6847	27 21 33.7	1.858
3	18 0 58.58	2.6830	27 19 21.2	2.004
4	18 3 39.51	2.6813	27 16 57.2	2.146
5	18 6 20.33	2.6793	27 14 21.7	2.285
6	18 9 1.03	2.6772	27 11 34.7	2.420
7	18 11 41.59	2.6748	27 8 36.3	2.551
8	18 14 22.01	2.6724	27 5 26.4	2.679
9	18 17 2.28	2.6698	27 2 5.2	2.804
10	18 19 42.39	2.6671	26 58 32.6	2.927
11	18 22 22.33	2.6642	26 54 48.8	3.048
12	18 25 2.09	2.6611	26 50 53.7	3.167
13	18 27 41.66	2.6578	26 46 47.4	3.283
14	18 30 21.03	2.6544	26 42 30.0	3.396
15	18 33 0.19	2.6508	26 38 1.5	3.508
16	18 35 39.13	2.6471	26 33 21.9	3.617
17	18 38 17.84	2.6433	26 28 31.4	3.723
18	18 40 56.32	2.6393	26 23 29.9	3.826
19	18 43 34.56	2.6353	26 18 17.5	3.927
20	18 46 12.55	2.6310	26 12 54.3	4.026
21	18 48 50.28	2.6266	26 7 20.4	4.122
22	18 51 27.74	2.6221	26 1 35.8	4.216
23	18 54 4.93	2.6174	25 55 40.6	4.308
24	18 56 41.83	2.6126	S. 25 49 34.8	4.398

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
SATURDAY 21.					MONDAY 23.				
0	h m s	s	° ' "	"	0	h m s	s	° ' "	"
0	18 56 41.83	2.6126	S. 25 49 34.8	6.184	0	20 55 3.24	2.3031	S. 17 59 26.2	12.757
1	18 59 18.44	2.6078	25 43 18.5	6.358	1	20 57 21.22	2.2963	17 46 38.0	12.850
2	19 1 54.76	2.6028	25 36 51.9	6.529	2	20 59 38.79	2.2895	17 33 44.2	12.942
3	19 4 30.77	2.5976	25 30 15.0	6.701	3	21 1 55.06	2.2828	17 20 45.0	13.032
4	19 7 6.47	2.5923	25 23 27.8	6.871	4	21 4 12.72	2.2759	17 7 40.4	13.121
5	19 9 41.85	2.5870	25 16 30.5	7.039	5	21 6 29.07	2.2693	16 54 30.5	13.208
6	19 12 16.91	2.5816	25 9 23.1	7.207	6	21 8 45.03	2.2626	16 41 15.5	13.292
7	19 14 51.64	2.5761	25 2 5.7	7.373	7	21 11 0.58	2.2559	16 27 55.5	13.374
8	19 17 26.04	2.5704	24 54 38.4	7.537	8	21 13 15.74	2.2493	16 14 30.6	13.456
9	19 20 0.09	2.5647	24 47 1.3	7.700	9	21 15 30.50	2.2428	16 1 0.8	13.536
10	19 22 33.80	2.5589	24 39 14.4	7.863	10	21 17 44.87	2.2363	15 47 26.3	13.613
11	19 25 7.16	2.5530	24 31 17.8	8.023	11	21 19 58.85	2.2298	15 33 47.2	13.688
12	19 27 40.16	2.5469	24 23 11.7	8.181	12	21 22 12.45	2.2234	15 20 3.7	13.762
13	19 30 12.79	2.5408	24 14 56.1	8.338	13	21 24 25.66	2.2170	15 6 15.8	13.834
14	19 32 45.06	2.5347	24 6 31.2	8.493	14	21 26 38.49	2.2108	14 52 23.6	13.905
15	19 35 16.95	2.5284	23 57 56.9	8.648	15	21 28 50.95	2.2045	14 38 27.2	13.973
16	19 37 48.47	2.5222	23 49 13.5	8.799	16	21 31 3.03	2.1983	14 24 26.8	14.040
17	19 40 19.61	2.5158	23 40 21.0	8.950	17	21 33 14.74	2.1921	14 10 22.4	14.106
18	19 42 50.37	2.5094	23 31 19.5	9.099	18	21 35 26.08	2.1860	13 56 14.1	14.170
19	19 45 20.74	2.5028	23 22 9.1	9.247	19	21 37 37.06	2.1800	13 42 2.0	14.232
20	19 47 50.71	2.4963	23 12 49.9	9.393	20	21 39 47.68	2.1740	13 27 46.3	14.291
21	19 50 20.29	2.4897	23 3 22.0	9.537	21	21 41 57.94	2.1681	13 13 27.1	14.349
22	19 52 49.47	2.4831	22 53 45.5	9.679	22	21 44 7.85	2.1623	12 59 4.4	14.407
23	19 55 18.26	2.4764	S. 22 44 0.5	9.820	23	21 46 17.41	2.1564	S. 12 44 38.3	14.462
SUNDAY 22.					TUESDAY 24.				
0	19 57 46.64	2.4696	S. 22 34 7.1	9.959	0	21 48 26.62	2.1506	S. 12 30 9.0	14.515
1	20 0 14.61	2.4628	22 24 5.4	10.096	1	21 50 35.48	2.1449	12 15 36.5	14.567
2	20 2 42.18	2.4561	22 13 55.6	10.231	2	21 52 44.01	2.1393	12 1 1.0	14.616
3	20 5 9.34	2.4492	22 3 37.7	10.365	3	21 54 52.20	2.1338	11 46 22.6	14.664
4	20 7 36.08	2.4423	21 53 11.8	10.498	4	21 57 0.06	2.1283	11 31 41.3	14.712
5	20 10 2.41	2.4354	21 42 38.0	10.628	5	21 59 7.60	2.1229	11 16 57.3	14.756
6	20 12 28.33	2.4285	21 31 56.5	10.756	6	22 1 14.81	2.1175	11 2 10.6	14.800
7	20 14 53.83	2.4215	21 21 7.3	10.883	7	22 3 21.70	2.1122	10 47 21.3	14.842
8	20 17 18.91	2.4146	21 10 10.6	11.008	8	22 5 28.27	2.1069	10 32 29.6	14.882
9	20 19 43.58	2.4076	20 59 6.4	11.131	9	22 7 34.53	2.1018	10 17 35.5	14.921
10	20 22 7.82	2.4006	20 47 54.9	11.252	10	22 9 40.49	2.0968	10 2 39.1	14.958
11	20 24 31.65	2.3936	20 36 36.2	11.371	11	22 11 46.14	2.0918	9 47 40.6	14.993
12	20 26 55.05	2.3866	20 25 10.4	11.488	12	22 13 51.50	2.0868	9 32 39.9	15.028
13	20 29 18.04	2.3796	20 13 37.6	11.604	13	22 15 56.56	2.0819	9 17 37.2	15.060
14	20 31 40.60	2.3726	20 1 57.9	11.718	14	22 18 1.33	2.0772	9 2 32.7	15.090
15	20 34 2.75	2.3656	19 50 11.4	11.830	15	22 20 5.82	2.0724	8 47 26.4	15.120
16	20 36 24.47	2.3586	19 38 18.3	11.940	16	22 22 10.02	2.0678	8 32 18.3	15.148
17	20 38 45.78	2.3517	19 26 18.6	12.048	17	22 24 13.95	2.0632	8 17 8.6	15.175
18	20 41 6.67	2.3447	19 14 12.5	12.155	18	22 26 17.60	2.0587	8 1 57.3	15.200
19	20 43 27.14	2.3377	19 2 0.0	12.260	19	22 28 20.99	2.0543	7 46 44.6	15.223
20	20 45 47.19	2.3307	18 49 41.3	12.363	20	22 30 24.12	2.0499	7 31 30.6	15.245
21	20 48 6.82	2.3238	18 37 16.4	12.464	21	22 32 26.98	2.0456	7 16 15.2	15.266
22	20 50 26.04	2.3169	18 24 45.6	12.563	22	22 34 29.59	2.0414	7 0 58.7	15.284
23	20 52 44.85	2.3100	18 12 8.8	12.662	23	22 36 31.95	2.0373	6 45 41.1	15.303
24	20 55 3.24	2.3031	S. 17 59 26.2	12.757	24	22 38 34.06	2.0332	S. 6 30 22.4	15.319

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
SUNDAY 29.					TUESDAY 31.				
0	1 46 0.48	1.9736	N. 16 20 18.6	11.744	0	3 23 50.60	2.1099	N. 23 59 52.2	7.148
1	1 47 58.96	1.9758	16 32 0.9	11.664	1	3 25 57.29	2.1130	24 6 57.8	7.038
2	1 49 57.57	1.9781	16 43 38.3	11.583	2	3 28 4.16	2.1160	24 13 56.7	6.925
3	1 51 56.33	1.9804	16 55 10.9	11.503	3	3 30 11.21	2.1190	24 20 48.8	6.813
4	1 53 55.22	1.9827	17 6 38.6	11.421	4	3 32 18.44	2.1221	24 27 34.2	6.700
5	1 55 54.25	1.9851	17 18 1.4	11.338	5	3 34 25.86	2.1251	24 34 12.8	6.586
6	1 57 53.43	1.9876	17 29 19.2	11.255	6	3 36 33.45	2.1280	24 40 44.5	6.472
7	1 59 52.76	1.9900	17 40 32.0	11.172	7	3 38 41.22	2.1310	24 47 9.4	6.358
8	2 1 52.23	1.9924	17 51 39.8	11.087	8	3 40 49.17	2.1340	24 53 27.4	6.242
9	2 3 51.85	1.9950	18 2 42.4	11.001	9	3 42 57.30	2.1369	24 59 38.4	6.125
10	2 5 51.63	1.9976	18 13 39.9	10.916	10	3 45 5.60	2.1398	25 5 42.4	6.008
11	2 7 51.56	2.0002	18 24 32.3	10.829	11	3 47 14.08	2.1428	25 11 39.4	5.892
12	2 9 51.65	2.0028	18 35 19.4	10.741	12	3 49 22.73	2.1456	25 17 29.4	5.774
13	2 11 51.90	2.0055	18 46 1.2	10.653	13	3 51 31.55	2.1484	25 23 12.3	5.656
14	2 13 52.31	2.0082	18 56 37.7	10.564	14	3 53 40.54	2.1513	25 28 48.1	5.537
15	2 15 52.88	2.0108	19 7 8.9	10.475	15	3 55 49.70	2.1541	25 34 16.7	5.418
16	2 17 53.61	2.0136	19 17 34.7	10.384	16	3 57 59.03	2.1568	25 39 38.2	5.298
17	2 19 54.51	2.0163	19 27 55.0	10.293	17	4 0 8.52	2.1595	25 44 52.5	5.178
18	2 21 55.57	2.0192	19 38 9.9	10.203	18	4 2 18.17	2.1623	25 49 59.6	5.058
19	2 23 56.81	2.0221	19 48 19.3	10.110	19	4 4 27.99	2.1649	25 54 59.4	4.936
20	2 25 58.22	2.0249	19 58 23.1	10.017	20	4 6 37.96	2.1675	25 59 51.9	4.814
21	2 27 59.80	2.0278	20 8 21.3	9.923	21	4 8 48.09	2.1702	26 4 37.1	4.692
22	2 30 1.55	2.0306	20 18 13.8	9.828	22	4 10 58.38	2.1728	26 9 14.9	4.569
23	2 32 3.47	2.0335	N. 20 28 0.7	9.733	23	4 13 8.82	2.1753	N. 26 13 45.4	4.447
MONDAY 30.					WEDNESDAY, SEPTEMBER 1.				
0	2 34 5.57	2.0365	N. 20 37 41.8	9.638	0	4 15 19.41	2.1778	N. 26 18 8.5	4.323
1	2 36 7.85	2.0394	20 47 17.2	9.542	PHASES OF THE MOON.				
2	2 38 10.30	2.0423	20 56 46.8	9.445					
3	2 40 12.93	2.0453	21 6 10.6	9.348					
4	2 42 15.74	2.0483	21 15 28.5	9.249					
5	2 44 18.73	2.0514	21 24 40.5	9.150					
6	2 46 21.91	2.0545	21 33 46.5	9.050					
7	2 48 25.27	2.0575	21 42 46.5	8.950					
8	2 50 28.81	2.0605	21 51 40.5	8.849					
9	2 52 32.53	2.0636	22 0 28.4	8.748					
10	2 54 36.44	2.0667	22 9 10.2	8.645					
11	2 56 40.53	2.0697	22 17 45.8	8.543					
12	2 58 44.80	2.0728	22 26 15.3	8.439					
13	3 0 49.26	2.0759	22 34 38.5	8.335					
14	3 2 53.91	2.0790	22 42 55.5	8.230					
15	3 4 58.74	2.0821	22 51 6.1	8.124					
16	3 7 3.76	2.0853	22 59 10.4	8.018					
17	3 9 8.97	2.0883	23 7 8.3	7.912					
18	3 11 14.36	2.0914	23 14 59.8	7.805					
19	3 13 19.94	2.0945	23 22 44.9	7.698					
20	3 15 25.70	2.0976	23 30 23.5	7.589					
21	3 17 31.65	2.1007	23 37 55.6	7.480					
22	3 19 37.78	2.1038	23 45 21.1	7.370					
23	3 21 44.10	2.1068	23 52 40.0	7.259					
24	3 23 50.60	2.1099	N. 23 59 52.2	7.148					

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SEPTEMBER, 1915.

AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S						Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Added to or Subtracted from Apparent Time.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.			
		h m s	s	° ' "	"	' "	s	m s	
Wed.	1	10 38 29.48	9.079	N. 8 35 24.3	-54.15	15 52.85	64.40	0 13.0	
Thur.	2	10 42 7.24	9.067	8 13 40.5	54.49	15 53.07	64.36	0 5.6	
Fri.	3	10 45 44.73	9.056	7 51 48.6	54.82	15 53.29	64.32	0 24.6	
Sat.	4	10 49 21.95	9.046	7 29 49.1	-55.14	15 53.52	64.28	0 43.9	
SUN.	5	10 52 58.92	9.036	7 7 42.1	55.44	15 53.75	64.24	1 3.4	
Mon.	6	10 56 35.67	9.027	6 45 28.0	55.73	15 53.99	64.21	1 23.2	
Tues.	7	11 0 12.19	9.018	6 23 7.3	-56.00	15 54.23	64.18	1 43.2	
Wed.	8	11 3 48.52	9.010	6 0 40.2	56.26	15 54.47	64.15	2 3.3	
Thur.	9	11 7 24.67	9.003	5 38 7.0	56.50	15 54.71	64.12	2 23.7	
Fri.	10	11 11 0.64	8.996	5 15 28.2	-56.73	15 54.96	64.09	2 44.2	
Sat.	11	11 14 36.47	8.990	4 52 44.1	56.94	15 55.21	64.07	3 4.9	
SUN.	12	11 18 12.15	8.984	4 29 55.1	57.14	15 55.47	64.05	3 25.7	
Mon.	13	11 21 47.71	8.979	4 7 1.5	-57.32	15 55.73	64.04	3 46.6	
Tues.	14	11 25 23.16	8.975	3 44 3.6	57.49	15 55.99	64.03	4 7.7	
Wed.	15	11 28 58.52	8.972	3 21 1.9	57.64	15 56.25	64.02	4 28.8	
Thur.	16	11 32 33.81	8.970	2 57 56.6	-57.78	15 56.51	64.01	4 50.0	
Fri.	17	11 36 9.05	8.968	2 34 48.1	57.91	15 56.78	64.01	5 11.3	
Sat.	18	11 39 44.25	8.967	2 11 36.7	58.03	15 57.05	64.01	5 32.6	
SUN.	19	11 43 19.45	8.967	1 48 22.8	-58.13	15 57.31	64.01	5 53.9	
Mon.	20	11 46 54.66	8.968	1 25 6.6	58.22	15 57.58	64.02	6 15.2	
Tues.	21	11 50 29.90	8.970	1 1 48.4	58.29	15 57.85	64.03	6 36.4	
Wed.	22	11 54 5.21	8.973	0 38 28.6	-58.35	15 58.12	64.04	6 57.6	
Thur.	23	11 57 40.60	8.977	N. 0 15 7.4	58.40	15 58.40	64.06	7 18.7	
Fri.	24	12 1 16.10	8.982	S. 0 8 14.8	58.44	15 58.67	64.08	7 39.7	
Sat.	25	12 4 51.73	8.988	0 31 37.7	-58.46	15 58.94	64.10	8 0.6	
SUN.	26	12 8 27.52	8.995	0 55 1.0	58.47	15 59.21	64.12	8 21.3	
Mon.	27	12 12 3.48	9.003	1 18 24.4	58.47	15 59.47	64.14	8 41.8	
Tues.	28	12 15 39.65	9.012	1 41 47.5	-58.45	15 59.74	64.17	9 2.1	
Wed.	29	12 19 16.04	9.022	2 5 10.0	58.42	16 0.01	64.20	9 22.3	
Thur.	30	12 22 52.68	9.033	2 28 31.7	58.37	16 0.28	64.23	9 42.1	
Fri.	31	12 26 29.58	9.044	S. 2 51 52.0	-58.31	16 0.55	64.27	10 1.7	

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0<sup>m</sup>.18 from 1 time.

The sign — prefixed to the hourly change of declination indicates that north declinations are south declinations increasing.

AT GREENWICH MEAN NOON.

Day of the Week.	Day of the Month.	THE SUN'S				Equation of Time, to be Subtracted from	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Added to Mean Time.		
		h m s	s	° ' "	"	m s	s	h m s
Wed.	1	10 38 29.45	9.081	N. 8 35 24.5	-54.16	0 13.08	0.775	10 38 16.37
Thur.	2	10 42 7.26	9.070	8 13 40.4	54.50	0 5.67	0.787	10 42 12.93
Fri.	3	10 45 44.79	9.059	7 51 48.3	54.82	0 24.69	0.798	10 46 9.48
Sat.	4	10 49 22.06	9.048	7 29 48.4	-55.14	0 43.97	0.809	10 50 6.03
SUN.	5	10 52 59.08	9.038	7 7 41.1	55.45	1 3.50	0.819	10 54 2.59
Mon.	6	10 56 35.88	9.029	6 45 26.8	55.74	1 23.27	0.828	10 57 59.14
Tues.	7	11 0 12.45	9.020	6 23 5.7	-56.01	1 43.24	0.836	11 1 55.70
Wed.	8	11 3 48.83	9.012	6 0 38.2	56.27	2 3.42	0.844	11 5 52.25
Thur.	9	11 7 25.03	9.005	5 38 4.8	56.51	2 23.77	0.852	11 9 48.80
Fri.	10	11 11 1.06	8.998	5 15 25.6	-56.74	2 44.30	0.859	11 13 45.36
Sat.	11	11 14 36.93	8.991	4 52 41.2	56.95	3 4.98	0.865	11 17 41.91
SUN.	12	11 18 12.66	8.986	4 29 51.8	57.15	3 25.80	0.870	11 21 38.46
Mon.	13	11 21 48.27	8.982	4 6 57.8	-57.34	3 46.74	0.875	11 25 35.02
Tues.	14	11 25 23.78	8.978	3 43 59.6	57.51	4 7.80	0.879	11 29 31.57
Wed.	15	11 28 59.19	8.974	3 20 57.6	57.66	4 28.94	0.882	11 33 28.13
Thur.	16	11 32 34.53	8.972	2 57 52.0	-57.80	4 50.15	0.885	11 37 24.68
Fri.	17	11 36 9.82	8.970	2 34 43.1	57.93	5 11.41	0.886	11 41 21.23
Sat.	18	11 39 45.08	8.969	2 11 31.4	58.04	5 32.70	0.887	11 45 17.79
SUN.	19	11 43 20.33	8.969	1 48 17.1	-58.14	5 54.01	0.887	11 49 14.34
Mon.	20	11 46 55.59	8.970	1 25 0.5	58.23	6 15.30	0.886	11 53 10.89
Tues.	21	11 50 30.89	8.972	1 1 42.0	58.31	6 36.55	0.884	11 57 7.45
Wed.	22	11 54 6.25	8.975	0 38 21.8	-58.37	6 57.75	0.881	12 1 4.00
Thur.	23	11 57 41.70	8.979	N. 0 15 0.3	58.42	7 18.86	0.877	12 5 0.55
Fri.	24	12 1 17.25	8.984	S. 0 8 22.2	58.45	7 39.86	0.872	12 8 57.11
Sat.	25	12 4 52.93	8.990	0 31 45.5	-58.48	8 0.73	0.866	12 12 53.66
SUN.	26	12 8 28.77	8.997	0 55 9.1	58.49	8 21.44	0.859	12 16 50.21
Mon.	27	12 12 4.79	9.005	1 18 32.8	58.48	8 41.98	0.851	12 20 46.77
Tues.	28	12 15 41.01	9.014	1 41 56.3	-58.46	9 2.32	0.843	12 24 43.32
Wed.	29	12 19 17.45	9.024	2 5 19.2	58.43	9 22.42	0.833	12 28 39.87
Thur.	30	12 22 54.14	9.035	2 28 41.1	58.39	9 42.29	0.822	12 32 36.43
Fri.	31	12 26 31.09	9.046	S. 2 52 1.7	-58.33	10 1.89	0.810	12 36 32.98

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign — prefixed to the hourly change of declination indicates that north declinations are decreasing; south declinations increasing.

Diff. for 1 Hour, +9<sup>s</sup>.8565.  
(Table III.)



Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	14 48.5	14 48.3	54 14.99	−0.165	54 14.30	+0.050	18 14.1	2.12	21.5
2	14 48.8	14 50.0	54 16.20	+0.266	54 20.67	0.478	19 5.5	2.15	22.5
3	14 52.0	14 54.5	54 27.64	0.682	54 37.00	0.875	19 56.8	2.12	23.5
4	14 57.6	15 1.4	54 48.58	+1.051	55 2.17	+1.210	20 47.3	2.08	24.5
5	15 5.6	15 10.2	55 17.54	1.349	55 34.45	1.466	21 36.3	2.01	25.5
6	15 15.1	15 20.3	55 52.61	1.556	56 11.68	1.618	22 23.8	1.95	26.5
7	15 25.6	15 31.1	56 31.33	+1.651	56 51.19	+1.654	23 10.0	1.90	27.5
8	15 36.4	15 41.7	57 10.90	1.626	57 30.11	1.570	23 55.7	1.90	28.5
9	15 46.7	15 51.4	57 48.48	1.487	58 5.70	1.380	0	.	0.0
10	15 55.7	15 59.5	58 21.51	+1.252	58 35.69	+1.108	0 41.9	1.95	1.0
11	16 2.9	16 5.8	58 48.06	0.953	58 58.53	0.792	1 29.7	2.04	2.0
12	16 8.1	16 9.9	59 7.06	0.630	59 13.66	0.471	2 20.3	2.18	3.0
13	16 11.2	16 12.0	59 18.38	+0.317	59 21.31	+0.172	3 14.5	2.34	4.0
14	16 12.3	16 12.2	59 22.55	+0.036	59 22.23	−0.087	4 12.5	2.49	5.0
15	16 11.8	16 10.9	59 20.50	−0.200	59 17.46	0.305	5 13.7	2.59	6.0
16	16 9.8	16 8.3	59 13.21	−0.402	59 7.84	−0.492	6 16.1	2.59	7.0
17	16 6.6	16 4.5	59 1.42	0.578	58 53.97	0.663	7 17.1	2.48	8.0
18	16 2.2	15 59.6	58 45.50	0.748	58 36.02	0.832	8 14.9	2.32	9.0
19	15 56.8	15 53.6	58 25.54	−0.914	58 14.08	−0.996	9 8.5	2.15	10.0
20	15 50.3	15 46.6	58 1.65	1.076	57 48.26	1.154	9 58.2	2.00	11.0
21	15 42.7	15 38.6	57 33.98	1.224	57 18.91	1.286	10 44.8	1.89	12.0
22	15 34.3	15 29.9	57 3.16	−1.337	56 46.89	−1.373	11 29.3	1.83	13.0
23	15 25.4	15 20.8	56 30.28	1.392	56 13.55	1.393	12 13.0	1.82	14.0
24	15 16.3	15 11.8	55 56.93	1.374	55 40.66	1.333	12 56.7	1.84	15.0
25	15 7.6	15 3.6	55 25.02	−1.270	55 10.26	−1.186	13 41.5	1.89	16.0
26	14 59.8	14 56.5	54 56.64	1.081	54 44.40	0.956	14 27.8	1.97	17.0
27	14 53.6	14 51.2	54 33.78	0.811	54 25.01	0.648	15 15.9	2.04	18.0
28	14 49.4	14 48.2	54 18.28	−0.471	54 13.76	−0.281	16 5.7	2.10	19.0
29	14 47.6	14 47.6	54 11.59	−0.080	54 11.88	+0.130	16 56.6	2.13	20.0
30	14 48.4	14 49.9	54 14.73	+0.345	54 20.17	0.561	17 47.6	2.11	21.0
31	14 52.1	14 55.0	54 28.20	+0.777	54 38.81	+0.990	18 37.9	2.07	22.0

CH MEAN TIME.

THE MOON'S RIGHT                      AND DECLINATION.

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THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION



MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

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SEPTEMBER, 1915.

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GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

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MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

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THE MOON'S RIGHT ASCENSION AND DECLINATION.

**NOTE.**—The mean time of semidiameter passing the meridian may be found by subtracting 0<sup>m</sup>.18 from the time.

The sign — prefixed to the hourly change of declination indicates that south declinations are increas

AT GREENWICH MEAN NOON.

h <sup>o</sup> a.	Day of the Month.	THE SUN'S				Equation of Time, to be Added to Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
		h m s	s	° ' "	"	m s	s	h m s
V.	1	12 26 31.09	9.046	S. 2 52 1.7	-58.33	10 1.89	0.810	12 36 32.98
	2	12 30 8.34	9.058	3 15 20.7	58.25	10 21.20	0.798	12 40 29.53
	3	12 33 45.89	9.071	3 38 37.7	58.16	10 40.20	0.785	12 44 26.09
n.	4	12 37 23.77	9.085	4 1 52.3	-58.05	10 58.87	0.771	12 48 22.64
s.	5	12 41 2.00	9.100	4 25 4.1	57.93	11 17.20	0.756	12 52 19.20
d.	6	12 44 40.59	9.116	4 48 12.9	57.79	11 35.16	0.740	12 56 15.75
ur.	7	12 48 19.56	9.132	5 11 18.1	-57.64	11 52.74	0.724	13 0 12.30
.	8	12 51 58.94	9.149	5 34 19.4	57.47	12 9.91	0.707	13 4 8.86
.	9	12 55 38.73	9.167	5 57 16.4	57.28	12 26.68	0.689	13 8 5.41
V.	10	12 59 18.96	9.185	6 20 8.8	-57.07	12 43.01	0.671	13 12 1.96
n.	11	13 2 59.62	9.204	6 42 56.0	56.85	12 58.89	0.652	13 15 58.52
s.	12	13 6 40.75	9.224	7 5 37.7	56.61	13 14.32	0.633	13 19 55.07
d.	13	13 10 22.36	9.244	7 28 13.5	-56.36	13 29.27	0.613	13 23 51.62
ir.	14	13 14 4.45	9.265	7 50 43.1	56.09	13 43.73	0.592	13 27 48.18
.	15	13 17 47.06	9.286	8 13 6.0	55.81	13 57.68	0.570	13 31 44.73
.	16	13 21 30.18	9.308	8 35 21.8	-55.51	14 11.10	0.548	13 35 41.29
V.	17	13 25 13.86	9.331	8 57 30.2	55.19	14 23.98	0.525	13 39 37.84
n.	18	13 28 58.09	9.355	9 19 30.9	54.86	14 36.30	0.501	13 43 34.40
es.	19	13 32 42.91	9.380	9 41 23.5	-54.51	14 48.04	0.476	13 47 30.95
d.	20	13 36 28.33	9.406	10 3 7.5	54.14	14 59.17	0.451	13 51 27.50
ir.	21	13 40 14.38	9.432	10 24 42.8	53.76	15 9.68	0.425	13 55 24.06
.	22	13 44 1.06	9.459	10 46 8.7	-53.38	15 19.56	0.398	13 59 20.61
.	23	13 47 48.40	9.487	11 7 25.1	52.98	15 28.77	0.370	14 3 17.17
V.	24	13 51 36.42	9.515	11 28 31.5	52.55	15 37.30	0.341	14 7 13.72
n.	25	13 55 25.14	9.545	11 49 27.6	-52.11	15 45.14	0.312	14 11 10.28
s.	26	13 59 14.57	9.575	12 10 12.9	51.66	15 52.26	0.282	14 15 6.83
d.	27	14 3 4.74	9.606	12 30 47.2	51.18	15 58.65	0.251	14 19 3.39
ir.	28	14 6 55.65	9.637	12 51 9.8	-50.69	16 4.30	0.219	14 22 59.94
.	29	14 10 47.32	9.669	13 11 20.6	50.19	16 9.18	0.187	14 26 56.50
.	30	14 14 39.76	9.702	13 31 19.1	49.67	16 13.29	0.155	14 30 53.05
V.	31	14 18 32.99	9.735	13 51 4.9	49.13	16 16.62	0.122	14 34 49.61
1.	32	14 22 27.02	9.768	S. 14 10 37.5	-48.57	16 19.14	0.088	14 38 46.16

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign — prefixed to the hourly change of declination indicates that south declinations are increasing.

Diff. for 1 Hour,  
+9<sup>s</sup>.8565.  
(Table III.)

AT GREENWICH MEAN NOON.												
Day of the Month.	Day of the Year.	THE SUN'S						Logarithm of the Radius Vector of the Earth.	Diff. for 1 Hour.	Mean Time Sidereal No.		
		True Longitude.			Diff. for 1 Hour.	Latitude.						
		$\lambda$	$\lambda'$									
		°	'	"	'	"	"	"		h	m	
1	274	187	13	34.0	12	44.8	147.54	+0.27	0.000 4312	-50.8	11	21 3
2	275	188	12	36.0	11	46.7	147.63	0.17	0.000 3092	50.9	11	17 3
3	276	189	11	40.3	10	50.9	147.73	+0.05	0.000 1869	51.0	11	13 4
4	277	190	10	46.9	9	57.4	147.82	-0.08	0.000 0643	-51.2	11	9 4
5	278	191	9	55.7	9	6.1	147.92	0.22	9.999 9413	51.4	11	5 5
6	279	192	9	6.8	8	17.1	148.01	0.35	9.999 8178	51.6	11	1 5
7	280	193	8	20.1	7	30.3	148.10	-0.45	9.999 6937	-51.8	10	57 5
8	281	194	7	35.6	6	45.6	148.19	0.53	9.999 5691	52.0	10	54
9	282	195	6	53.1	6	3.0	148.27	0.59	9.999 4439	52.3	10	50
10	283	196	6	12.6	5	22.5	148.35	-0.63	9.999 3182	-52.5	10	46 1
11	284	197	5	34.1	4	43.8	148.43	0.64	9.999 1919	52.7	10	42 1
12	285	198	4	57.4	4	7.0	148.51	0.61	9.999 0653	52.8	10	38 2
13	286	199	4	22.5	3	32.0	148.59	-0.55	9.998 9384	-52.9	10	34 2
14	287	200	3	49.4	2	58.8	148.66	0.46	9.998 8115	52.9	10	30 2
15	288	201	3	18.0	2	27.3	148.73	0.34	9.998 6847	52.8	10	26 3
16	289	202	2	48.4	1	57.5	148.80	-0.21	9.998 5582	-52.6	10	22 3
17	290	203	2	20.4	1	29.4	148.87	-0.08	9.998 4322	52.4	10	18 4
18	291	204	1	54.2	1	3.1	148.95	+0.05	9.998 3068	52.1	10	14 4
19	292	205	1	29.8	0	38.6	149.02	+0.18	9.998 1823	-51.7	10	10 4
20	293	206	1	7.2	0	15.8	149.10	0.29	9.998 0587	51.3	10	6 5
21	294	206	60	46.4	59	55.0	149.18	0.37	9.997 9361	50.8	10	2 5
22	295	207	60	27.6	59	36.0	149.26	+0.43	9.997 8146	-50.3	9	59
23	296	208	60	10.8	59	19.0	149.34	0.47	9.997 6943	49.9	9	55
24	297	209	59	55.9	59	4.1	149.42	0.48	9.997 5752	49.4	9	51
25	298	210	59	43.1	58	51.2	149.51	+0.46	9.997 4572	-48.9	9	47 1
26	299	211	59	32.4	58	40.3	149.60	0.42	9.997 3404	48.4	9	43 1
27	300	212	59	23.8	58	31.6	149.69	0.36	9.997 2248	48.0	9	39 2
28	301	213	59	17.4	58	25.0	149.78	+0.27	9.997 1102	-47.5	9	35 2
29	302	214	59	13.0	58	20.5	149.87	0.17	9.996 9968	47.1	9	31 2
30	303	215	59	10.9	58	18.3	149.96	+0.06	9.996 8844	46.7	9	27 3
31	304	216	59	10.9	58	18.2	150.05	-0.07	9.996 7729	46.3	9	23 3
32	305	217	59	13.1	58	20.2	150.14	-0.20	9.996 6623	-45.9	9	19 4

NOTE.—The longitudes in the column  $\lambda$  are referred to the true equinox of their own date, while those in the column  $\lambda'$  are referred to the mean equinox of the beginning of the Besselian fictitious year.

Diff. for 1 E  
—9°.839  
(Table I)

GREENWICH MEAN TIME.

THE MOON'S

DIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
'	' "	' "	"	' "	"	h m	m	d
.1	14 55.0	54 28.20	+0.777	54 38.81	+0.990	18 37.9	2.07	22.0
.6	15 2.8	54 51.94	1.196	55 7.46	1.388	19 26.8	2.01	23.0
.6	15 13.0	55 25.19	1.564	55 44.92	1.720	20 14.3	1.95	24.0
.9	15 25.1	56 6.38	+1.851	56 29.23	+1.951	21 0.5	1.91	25.0
.6	15 38.2	56 53.08	2.018	57 17.51	2.047	21 46.3	1.91	26.0
.9	15 51.5	57 42.04	2.034	58 6.15	1.978	22 32.5	1.95	27.0
.8	16 3.7	58 29.33	+1.878	58 51.06	+1.736	23 20.2	2.04	28.0
.1	16 13.8	59 10.84	1.554	59 28.21	1.336	0	.	29.0
.8	16 21.0	59 42.80	1.091	59 54.32	0.826	0 10.7	2.18	0.6
.2	16 24.6	60 2.59	+0.550	60 7.52	+0.272	1 5.0	2.35	1.6
.0	16 24.6	60 9.15	+0.002	60 7.63	−0.251	2 3.5	2.52	2.6
.4	16 21.5	60 3.20	−0.483	59 56.13	0.691	3 5.6	2.63	3.6
.9	16 15.8	59 46.74	−0.868	59 35.43	−1.012	4 9.2	2.64	4.6
.3	16 8.5	59 22.56	1.128	59 8.47	1.215	5 11.6	2.54	5.6
.4	16 0.2	58 53.49	1.277	58 37.90	1.317	6 10.6	2.37	6.6
.8	15 51.4	58 21.95	−1.339	58 5.81	−1.349	7 5.0	2.18	7.6
.0	15 42.6	57 49.63	1.346	57 33.55	1.333	7 55.1	2.00	8.6
.3	15 34.0	57 17.65	1.317	57 1.96	1.298	8 41.7	1.88	9.6
.8	15 25.6	56 46.50	−1.277	56 31.32	−1.252	9 26.0	1.81	10.6
.6	15 17.6	56 16.46	1.224	56 1.95	1.194	10 9.2	1.79	11.6
.8	15 10.1	55 47.81	1.162	55 34.09	1.123	10 52.3	1.81	12.6
.5	15 3.0	55 20.88	−1.077	55 8.27	−1.023	11 36.3	1.86	13.6
.8	14 56.8	54 56.37	0.959	54 45.29	0.885	12 21.9	1.94	14.6
.0	14 51.6	54 35.19	0.797	54 26.22	0.696	13 9.4	2.02	15.6
.5	14 47.8	54 18.53	−0.582	54 12.30	−0.454	13 58.7	2.08	16.6
.5	14 45.8	54 7.70	−0.311	54 4.90	−0.155	14 49.3	2.12	17.6
.5	14 45.9	54 4.04	+0.014	54 5.28	+0.195	15 40.1	2.10	18.6
.8	14 48.4	54 8.75	+0.385	54 14.56	+0.585	16 30.2	2.06	19.6
.6	14 53.6	54 22.81	0.791	54 33.55	1.000	17 18.9	2.00	20.6
.2	15 1.5	54 46.80	1.208	55 2.54	1.414	18 6.0	1.92	21.6
.4	15 12.0	55 20.71	1.612	55 41.19	1.799	18 51.5	1.88	22.6
.2	15 24.8	56 3.82	+1.969	56 28.35	+2.115	19 36.3	1.86	23.6





## GREENWICH MEAN TIME.

## THE MOON'S RIGHT ASCENSION AND DECLINATION.

Diff.  
for  
1 Min.

0	15.915
3	15.938
4	15.940
1	15.949
3	15.958
0	15.965
1	15.971
5	15.975
1	15.978
8	15.979
6	15.979
3	15.977
8	15.973
1	15.968
0	15.960
5	15.954
5	15.944
8	15.933
4	15.920
2	15.906
1	15.890
0	15.873
8	15.853
4	15.831
6	15.806
4	15.784
7	15.758
4	15.731
4	15.700
6	15.671
9	15.638
1	15.603
2	15.566
0	15.528
5	15.488
5	15.445
9	15.401
7	15.357
7	15.309
8	15.260
9	15.209
9	15.156
6	15.101
0	15.045
0	14.987
4	14.927
2	14.864
1	14.799
1	14.733

## GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

## THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
WEDNESDAY 13.					FRIDAY 15.				
0	17 22 29.06	2.7041	S. 27 15 8.3	0.446	0	19 28 8.65	2.4841	S. 24 4 27.3	7.974
1	17 25 11.27	2.7028	27 15 29.2	0.251	1	19 30 37.40	2.4771	23 56 24.5	8.118
2	17 27 53.40	2.7015	27 15 38.4	-0.056	2	19 33 5.90	2.4701	23 48 13.1	8.261
3	17 30 35.45	2.7000	27 15 35.9	+0.138	3	19 35 33.90	2.4631	23 39 53.2	8.402
4	17 33 17.40	2.6983	27 15 21.8	0.332	4	19 38 1.47	2.4560	23 31 24.9	8.541
5	17 35 59.24	2.6963	27 14 56.1	0.526	5	19 40 28.62	2.4489	23 22 48.3	8.678
6	17 38 40.96	2.6943	27 14 18.7	0.720	6	19 42 55.34	2.4417	23 14 3.6	8.813
7	17 41 22.56	2.6921	27 13 29.7	0.913	7	19 45 21.62	2.4345	23 5 10.7	8.948
8	17 44 4.01	2.6897	27 12 29.2	1.104	8	19 47 47.48	2.4273	22 56 9.8	9.080
9	17 46 45.32	2.6872	27 11 17.2	1.296	9	19 50 12.90	2.4201	22 47 1.1	9.211
10	17 49 26.47	2.6844	27 9 53.7	1.488	10	19 52 37.89	2.4129	22 37 44.5	9.341
11	17 52 7.45	2.6815	27 8 18.7	1.678	11	19 55 2.45	2.4057	22 28 20.2	9.468
12	17 54 48.25	2.6784	27 6 32.3	1.868	12	19 57 26.57	2.3983	22 18 48.3	9.594
13	17 57 28.86	2.6752	27 4 34.6	2.057	13	19 59 50.25	2.3911	22 9 8.9	9.718
14	18 0 9.27	2.6718	27 2 25.5	2.246	14	20 2 13.50	2.3839	21 59 22.1	9.841
15	18 2 49.48	2.6683	27 0 5.1	2.433	15	20 4 36.32	2.3767	21 49 28.0	9.962
16	18 5 29.47	2.6646	26 57 33.5	2.619	16	20 6 58.70	2.3693	21 39 26.7	10.081
17	18 8 9.23	2.6608	26 54 50.8	2.805	17	20 9 20.64	2.3621	21 29 18.3	10.199
18	18 10 48.76	2.6568	26 51 56.9	2.990	18	20 11 42.15	2.3549	21 19 2.8	10.316
19	18 13 28.04	2.6526	26 48 52.0	3.174	19	20 14 3.23	2.3477	21 8 40.4	10.430
20	18 16 7.07	2.6484	26 45 36.0	3.357	20	20 16 23.87	2.3404	20 58 11.2	10.543
21	18 18 45.85	2.6441	26 42 9.1	3.539	21	20 18 44.08	2.3332	20 47 35.3	10.654
22	18 21 24.36	2.6395	26 38 31.3	3.720	22	20 21 3.85	2.3260	20 36 52.7	10.763
23	18 24 2.59	2.6348	S. 26 34 42.7	3.900	23	20 23 23.20	2.3188	S. 20 26 3.7	10.871
THURSDAY 14.					SATURDAY 16.				
0	18 26 40.53	2.6299	S. 26 30 43.3	4.079	0	20 25 42.11	2.3116	S. 20 15 8.2	10.978
1	18 29 18.18	2.6250	26 26 33.2	4.257	1	20 28 0.59	2.3045	20 4 6.4	11.082
2	18 31 55.53	2.6199	26 22 12.5	4.433	2	20 30 18.65	2.2975	19 52 58.4	11.185
3	18 34 32.57	2.6148	26 17 41.3	4.608	3	20 32 36.29	2.2904	19 41 44.2	11.287
4	18 37 9.30	2.6095	26 12 59.6	4.783	4	20 34 53.50	2.2833	19 30 24.0	11.386
5	18 39 45.71	2.6041	26 8 7.4	4.956	5	20 37 10.29	2.2763	19 18 57.9	11.484
6	18 42 21.79	2.5986	26 3 4.9	5.127	6	20 39 26.66	2.2693	19 7 25.9	11.581
7	18 44 57.54	2.5929	25 57 52.2	5.297	7	20 41 42.61	2.2623	18 55 48.2	11.676
8	18 47 32.94	2.5872	25 52 29.3	5.466	8	20 43 58.14	2.2554	18 44 4.8	11.769
9	18 50 8.00	2.5814	25 46 56.3	5.633	9	20 46 13.26	2.2486	18 32 15.9	11.861
10	18 52 42.71	2.5755	25 41 13.3	5.800	10	20 48 27.97	2.2418	18 20 21.5	11.952
11	18 55 17.06	2.5694	25 35 20.3	5.965	11	20 50 42.28	2.2351	18 8 21.7	12.040
12	18 57 51.04	2.5633	25 29 17.5	6.128	12	20 52 56.18	2.2283	17 56 16.7	12.127
13	19 0 24.65	2.5571	25 23 4.9	6.290	13	20 55 9.68	2.2216	17 44 6.5	12.213
14	19 2 57.89	2.5508	25 16 42.7	6.451	14	20 57 22.77	2.2149	17 31 51.2	12.297
15	19 5 30.74	2.5443	25 10 10.8	6.610	15	20 59 35.47	2.2084	17 19 30.9	12.378
16	19 8 3.21	2.5379	25 3 29.5	6.768	16	21 1 47.78	2.2018	17 7 5.8	12.459
17	19 10 35.29	2.5314	24 56 38.7	6.924	17	21 3 59.69	2.1953	16 54 35.8	12.539
18	19 13 6.98	2.5248	24 49 38.6	7.078	18	21 6 11.22	2.1890	16 42 1.1	12.617
19	19 15 38.27	2.5182	24 42 29.3	7.232	19	21 8 22.37	2.1826	16 29 21.8	12.693
20	19 18 9.16	2.5115	24 35 10.8	7.383	20	21 10 33.13	2.1763	16 16 38.0	12.768
21	19 20 39.65	2.5048	24 27 43.3	7.533	21	21 12 43.52	2.1701	16 3 49.7	12.841
22	19 23 9.73	2.4979	24 20 6.8	7.682	22	21 14 53.54	2.1638	15 50 57.1	12.913
23	19 25 39.40	2.4910	24 12 21.4	7.829	23	21 17 3.18	2.1577	15 38 0.2	12.983
24	19 28 8.65	2.4841	S. 24 4 27.3	7.974	24	21 19 12.46	2.1517	S. 15 24 59.1	13.052

GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## GREENWICH MEAN TIME.

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THE MOON'S RIGHT ASCENSION AND DECLINATION.



Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Subtracted from Apparent Time.	Diff. for Hour.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.			
		h m s	s	° ' "	"	' "	s	m s	s
Mon.	1	14 22 24.37	9.768	S.14 10 24.3	-48.58	16 8.92	66.80	16 19.11	0.088
Tues.	2	14 26 19.20	9.802	14 29 43.5	48.01	16 9.17	66.92	16 20.84	0.054
Wed.	3	14 30 14.84	9.836	14 48 48.8	47.42	16 9.41	67.03	16 21.74	0.020
Thur.	4	14 34 11.32	9.870	15 7 39.7	-46.81	16 9.65	67.15	16 21.83	0.015
Fri.	5	14 38 8.62	9.905	15 26 15.7	46.18	16 9.89	67.26	16 21.08	0.049
Sat.	6	14 42 6.77	9.940	15 44 36.6	45.54	16 10.13	67.38	16 19.49	0.084
SUN.	7	14 46 5.75	9.975	16 2 41.8	-44.88	16 10.37	67.50	16 17.07	0.119
Mon.	8	14 50 5.57	10.010	16 20 30.9	44.20	16 10.61	67.62	16 13.81	0.154
Tues.	9	14 54 6.24	10.045	16 38 3.4	43.50	16 10.84	67.74	16 9.72	0.188
Wed.	10	14 58 7.73	10.080	16 55 19.0	-42.79	16 11.08	67.86	16 4.79	0.223
Thur.	11	15 2 10.06	10.114	17 12 17.2	42.06	16 11.31	67.98	15 59.04	0.258
Fri.	12	15 6 13.22	10.149	17 28 57.7	41.31	16 11.54	68.10	15 52.44	0.292
Sat.	13	15 10 17.22	10.184	17 45 20.0	-40.54	16 11.77	68.22	15 45.03	0.327
SUN.	14	15 14 22.05	10.218	18 1 23.7	39.76	16 12.00	68.34	15 36.78	0.361
Mon.	15	15 18 27.71	10.253	18 17 8.5	38.96	16 12.22	68.46	15 27.70	0.396
Tues.	16	15 22 34.20	10.288	18 32 34.0	-38.15	16 12.44	68.58	15 17.80	0.430
Wed.	17	15 26 41.51	10.322	18 47 39.8	37.32	16 12.66	68.70	15 7.07	0.465
Thur.	18	15 30 49.66	10.356	19 2 25.5	36.47	16 12.87	68.82	14 55.51	0.499
Fri.	19	15 34 58.62	10.391	19 16 50.9	-35.61	16 13.08	68.94	14 43.14	0.533
Sat.	20	15 39 8.41	10.425	19 30 55.4	34.74	16 13.28	69.05	14 29.94	0.567
SUN.	21	15 43 19.02	10.459	19 44 38.8	33.86	16 13.48	69.16	14 15.93	0.601
Mon.	22	15 47 30.43	10.493	19 58 0.7	-32.96	16 13.67	69.27	14 1.11	0.634
Tues.	23	15 51 42.66	10.526	20 11 0.8	32.04	16 13.86	69.38	13 45.49	0.668
Wed.	24	15 55 55.68	10.559	20 23 38.7	31.11	16 14.04	69.48	13 29.07	0.701
Thur.	25	16 0 9.49	10.592	20 35 54.0	-30.16	16 14.22	69.59	13 11.87	0.733
Fri.	26	16 4 24.08	10.624	20 47 46.4	29.20	16 14.40	69.69	12 53.88	0.765
Sat.	27	16 8 39.43	10.656	20 59 15.6	28.23	16 14.57	69.80	12 35.14	0.797
SUN.	28	16 12 55.54	10.687	21 10 21.2	-27.24	16 14.74	69.90	12 15.64	0.828
Mon.	29	16 17 12.39	10.717	21 21 3.0	26.23	16 14.90	70.00	11 55.40	0.858
Tues.	30	16 21 29.96	10.747	21 31 20.5	25.22	16 15.05	70.09	11 34.45	0.888
Wed.	31	16 25 48.24	10.776	S.21 41 13.5	-24.19	16 15.20	70.18	11 12.79	0.917

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0.18 from the sidereal time.

The sign — prefixed to the hourly change of declination indicates that south declinations are increasing.

AT GREENWICH MEAN NOON.

Day of the Week.	Day of the Month.	THE SUN'S				Equation of Time, to be Added to Mean Time.	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.			
		h m s	s	° ' "	"	m s	s	h m s
Mon.	1	14 22 27.02	9.768	S. 14 10 37.5	−48.57	16 19.14	0.088	14 38 46.16
Tues.	2	14 26 21.87	9.802	14 29 56.6	48.00	16 20.85	0.054	14 42 42.72
Wed.	3	14 30 17.52	9.836	14 49 1.7	47.41	16 21.75	0.020	14 46 39.27
Thur.	4	14 34 14.01	9.870	15 7 52.4	−46.80	16 21.82	0.015	14 50 35.83
Fri.	5	14 38 11.32	9.905	15 26 28.3	46.18	16 21.06	0.049	14 54 32.38
Sat.	6	14 42 9.47	9.940	15 44 49.0	45.54	16 19.47	0.084	14 58 28.94
SUN.	7	14 46 8.46	9.975	16 2 54.0	−44.87	16 17.04	0.119	15 2 25.50
Mon.	8	14 50 8.28	10.010	16 20 42.8	44.19	16 13.77	0.154	15 6 22.05
Tues.	9	14 54 8.94	10.045	16 38 15.2	43.49	16 9.67	0.188	15 10 18.61
Wed.	10	14 58 10.43	10.080	16 55 30.5	−42.78	16 4.73	0.223	15 14 15.16
Thur.	11	15 2 12.76	10.114	17 12 28.5	42.04	15 58.97	0.258	15 18 11.72
Fri.	12	15 6 15.91	10.149	17 29 8.6	41.29	15 52.37	0.292	15 22 8.28
Sat.	13	15 10 19.90	10.183	17 45 30.6	−40.53	15 44.94	0.327	15 26 4.84
SUN.	14	15 14 24.71	10.218	18 1 34.1	39.75	15 36.68	0.361	15 30 1.39
Mon.	15	15 18 30.35	10.252	18 17 18.5	38.95	15 27.60	0.396	15 33 57.95
Tues.	16	15 22 36.82	10.287	18 32 43.7	−38.14	15 17.69	0.430	15 37 54.51
Wed.	17	15 26 44.11	10.321	18 47 49.2	37.31	15 6.95	0.465	15 41 51.06
Thur.	18	15 30 52.23	10.356	19 2 34.6	36.47	14 55.39	0.499	15 45 47.62
Fri.	19	15 35 1.17	10.390	19 16 59.6	−35.61	14 43.01	0.533	15 49 44.18
Sat.	20	15 39 10.93	10.424	19 31 3.8	34.74	14 29.81	0.567	15 53 40.73
SUN.	21	15 43 21.50	10.457	19 44 46.9	33.85	14 15.79	0.601	15 57 37.29
Mon.	22	15 47 32.88	10.491	19 58 8.4	−32.95	14 0.96	0.634	16 1 33.85
Tues.	23	15 51 45.07	10.524	20 11 8.1	32.03	13 45.34	0.668	16 5 30.41
Wed.	24	15 55 58.05	10.557	20 23 45.7	31.10	13 28.91	0.701	16 9 26.96
Thur.	25	16 0 11.82	10.590	20 36 0.6	−30.15	13 11.70	0.733	16 13 23.52
Fri.	26	16 4 26.36	10.622	20 47 52.7	29.19	12 53.72	0.765	16 17 20.08
Sat.	27	16 8 41.67	10.653	20 59 21.5	28.21	12 34.97	0.797	16 21 16.64
SUN.	28	16 12 57.72	10.684	21 10 26.8	−27.22	12 15.47	0.828	16 25 13.20
Mon.	29	16 17 14.52	10.715	21 21 8.2	26.22	11 55.23	0.858	16 29 9.75
Tues.	30	16 21 32.04	10.745	21 31 25.3	25.21	11 34.28	0.888	16 33 6.31
Wed.	31	16 25 50.25	10.773	S. 21 41 18.0	−24.18	11 12.62	0.917	16 37 2.87

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign − prefixed to the hourly change of declination indicates that south declinations are increasing.

Diff. for 1 Hour,  
+9°.8565.  
(Table III.)



Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 18.2	15 24.8	56 3.82	+1.969	56 28.35	+2.115	19 36.3	1.86	23.6
2	15 32.0	15 39.4	56 54.47	2.232	57 21.78	2.313	20 21.2	1.89	24.6
3	15 47.0	15 54.7	57 49.82	2.353	58 18.06	2.345	21 7.4	1.97	25.6
4	16 2.3	16 9.6	58 45.90	+2.286	59 12.70	+2.171	21 56.3	2.11	26.6
5	16 16.5	16 22.6	59 37.78	1.999	60 0.46	1.772	22 49.0	2.30	27.6
6	16 28.0	16 32.4	60 20.10	1.494	60 36.14	1.174	23 46.7	2.51	28.6
7	16 35.6	16 37.7	60 48.15	+0.823	60 55.80	+0.449	6	.	0.2
8	16 38.6	16 38.2	60 58.91	+0.070	60 57.51	-0.301	0 49.1	2.68	1.2
9	16 36.6	16 34.0	60 51.77	-0.651	60 42.00	0.970	1 54.6	2.75	2.2
10	16 30.3	16 25.8	60 28.64	-1.249	60 12.21	-1.481	3 0.2	2.68	3.2
11	16 20.7	16 15.0	59 53.29	1.664	59 32.46	1.799	4 2.7	2.51	4.2
12	16 9.0	16 2.7	59 10.31	1.886	58 47.36	1.932	5 0.2	2.28	5.2
13	15 56.4	15 50.1	58 24.10	-1.939	58 0.96	-1.913	5 52.4	2.07	6.2
14	15 43.9	15 37.9	57 38.28	1.864	57 16.31	1.795	6 40.3	1.92	7.2
15	15 32.2	15 26.7	56 55.26	1.711	56 35.30	1.616	7 25.1	1.82	8.2
16	15 21.6	15 16.8	56 16.51	-1.515	55 58.95	-1.411	8 8.1	1.78	9.2
17	15 12.4	15 8.3	55 42.65	1.306	55 27.59	1.204	8 50.7	1.78	10.2
18	15 4.5	15 1.1	55 13.75	1.103	55 1.11	1.004	9 33.9	1.82	11.2
19	14 57.9	14 55.1	54 49.63	-0.910	54 39.26	-0.818	10 18.4	1.89	12.2
20	14 52.6	14 50.4	54 29.99	0.726	54 21.83	0.633	11 5.0	1.98	13.2
21	14 48.4	14 46.8	54 14.80	0.538	54 8.92	0.441	11 53.6	2.06	14.2
22	14 45.6	14 44.6	54 4.22	-0.341	54 0.76	-0.234	12 43.8	2.11	15.2
23	14 44.0	14 43.9	53 58.64	-0.119	53 57.94	+0.003	13 34.6	2.12	16.2
24	14 44.1	14 44.8	53 58.75	+0.134	54 1.20	0.276	14 25.0	2.08	17.2
25	14 45.9	14 47.6	54 5.41	+0.427	54 11.49	+0.588	15 14.0	2.00	18.2
26	14 49.8	14 52.5	54 19.55	0.757	54 29.69	0.934	16 1.0	1.92	19.2
27	14 55.9	14 59.8	54 41.99	1.117	54 56.51	1.304	16 46.2	1.85	20.2
28	15 4.4	15 9.6	55 13.29	+1.492	55 32.31	+1.677	17 30.0	1.81	21.2
29	15 15.4	15 21.7	55 53.50	1.854	56 16.76	2.020	18 13.4	1.81	22.2
30	15 28.5	15 35.8	56 41.91	2.168	57 8.69	2.291	18 57.3	1.86	23.2
31	15 43.5	15 51.4	57 36.77	+2.383	58 5.73	+2.437	19 43.2	1.98	24.2

GR

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

G

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

**NOVEMBER, 1915.**

129

**MEAN TIME.**

## THE MOON'S RIGHT

**AND DECLINATION.**

2281°-1915-9



G

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

Diff.  
for  
1 Min.

"  
0.813  
0.683  
0.553  
0.423  
0.294  
0.164  
+0.033  
-0.097  
0.226  
0.356  
0.486  
0.615  
0.745  
0.874  
1.003  
1.133  
1.263  
1.391  
1.519  
1.648  
1.776  
1.904  
2.032  
2.158  
  
2.286  
2.413  
2.539  
2.666  
2.791  
2.917  
3.043  
3.168  
3.293  
3.416  
3.540  
3.663  
3.787  
3.909  
4.032  
4.153  
4.274  
4.395  
4.515  
4.635  
4.755  
4.874  
4.993  
5.110  
5.228

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

NOVEMBER, 1915.

133

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

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AT GREENWICH APPARENT NOON.

Day of the Week.	Day of the Month.	THE SUN'S					Sidereal Time of Semidiameter Passing Meridian.	Equation of Time, to be Subtracted from Added to Apparent Time.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Semidiameter.		
		h m s	s	° ' "	"	' "	s	m s
Wed.	1	16 25 48.24	10.776	S.21 41 13.5	-24.19	16 15.20	70.18	11 12.79
Thur.	2	16 30 7.20	10.804	21 50 41.6	23.15	16 15.35	70.26	10 50.44
Fri.	3	16 34 26.83	10.831	21 59 44.6	22.10	16 15.50	70.35	10 27.44
Sat.	4	16 38 47.09	10.857	22 8 22.2	-21.03	16 15.64	70.43	10 3.80
SUN.	5	16 43 7.96	10.882	22 16 34.1	19.95	16 15.78	70.51	9 39.55
Mon.	6	16 47 29.42	10.905	22 24 20.0	18.87	16 15.92	70.59	9 14.72
Tues.	7	16 51 51.42	10.927	22 31 39.7	-17.77	16 16.05	70.66	8 49.35
Wed.	8	16 56 13.94	10.948	22 38 32.9	16.66	16 16.18	70.73	8 23.46
Thur.	9	17 0 36.94	10.968	22 44 59.4	15.54	16 16.31	70.80	7 57.09
Fri.	10	17 5 0.40	10.986	22 50 59.0	-14.42	16 16.43	70.86	7 30.26
Sat.	11	17 9 24.28	11.003	22 56 31.6	13.29	16 16.55	70.92	7 3.02
SUN.	12	17 13 48.54	11.018	23 1 36.9	12.15	16 16.66	70.97	6 35.38
Mon.	13	17 18 13.16	11.032	23 6 14.8	-11.01	16 16.77	71.02	6 7.40
Tues.	14	17 22 38.11	11.045	23 10 25.1	9.86	16 16.88	71.06	5 39.09
Wed.	15	17 27 3.35	11.057	23 14 7.8	8.70	16 16.99	71.10	5 10.49
Thur.	16	17 31 28.85	11.067	23 17 22.7	- 7.54	16 17.09	71.13	4 41.63
Fri.	17	17 35 54.58	11.076	23 20 9.7	6.37	16 17.18	71.16	4 12.53
Sat.	18	17 40 20.52	11.084	23 22 28.7	5.21	16 17.27	71.18	3 43.23
SUN.	19	17 44 46.64	11.091	23 24 19.6	- 4.04	16 17.35	71.21	3 13.76
Mon.	20	17 49 12.89	11.096	23 25 42.4	2.86	16 17.42	71.23	2 44.14
Tues.	21	17 53 39.25	11.100	23 26 37.0	1.69	16 17.48	71.25	2 14.42
Wed.	22	17 58 5.70	11.103	23 27 3.4	- 0.51	16 17.54	71.26	1 44.61
Thur.	23	18 2 32.20	11.104	23 27 1.4	+ 0.67	16 17.60	71.26	1 14.76
Fri.	24	18 6 58.71	11.104	23 26 31.3	1.85	16 17.65	71.26	0 44.88
Sat.	25	18 11 25.21	11.103	23 25 32.8	+ 3.02	16 17.69	71.25	0 15.02
SUN.	26	18 15 51.67	11.101	23 24 6.1	4.20	16 17.73	71.24	0 14.79
Mon.	27	18 20 18.05	11.097	23 22 11.1	5.38	16 17.76	71.23	0 44.54
Tues.	28	18 24 44.33	11.092	23 19 47.9	+ 6.55	16 17.79	71.21	1 14.17
Wed.	29	18 29 10.47	11.086	23 16 56.6	7.72	16 17.81	71.19	1 43.67
Thur.	30	18 33 36.44	11.078	23 13 37.2	8.89	16 17.82	71.16	2 13.00
Fri.	31	18 38 2.20	11.068	23 9 49.7	10.06	16 17.83	71.13	2 42.12
Sat.	32	18 42 27.72	11.057	S.23 5 34.4	+11.22	16 17.84	71.09	3 11.01

NOTE.—The mean time of semidiameter passing the meridian may be found by subtracting 0<sup>s</sup>.19 from the time.  
The sign — prefixed to the hourly change of declination indicates that south declinations are increasing; sign + indicates that south declinations are decreasing.

AT GREENWICH MEAN NOON.

Day of the Week.	Day of the Month.	THE SUN'S				Equation of Time, to be Added to	Diff. for 1 Hour.	Sidereal Time, or Right Ascension of Mean Sun.
		Apparent Right Ascension.	Diff. for 1 Hour.	Apparent Declination.	Diff. for 1 Hour.	Subtracted from Mean Time.		
		<div>h m s</div>	<div>s</div>	<div>° ' "</div>	<div>"</div>	<div>m s</div>	<div>s</div>	<div>h m s</div>
Wed.	1	16 25 50.25	10.773	S. 21 41 18.0	-24.18	11 12.62	0.917	16 37 2.87
Thur.	2	16 30 9.16	10.801	21 50 45.8	23.14	10 50.27	0.945	16 40 59.43
Fri.	3	16 34 28.72	10.828	21 59 48.5	22.09	10 27.27	0.972	16 44 55.98
Sat.	4	16 38 48.91	10.854	22 8 25.7	-21.02	10 3.63	0.998	16 48 52.54
SUN.	5	16 43 9.71	10.879	22 16 37.3	19.94	9 39.39	1.022	16 52 49.10
Mon.	6	16 47 31.10	10.902	22 24 22.9	18.85	9 14.56	1.046	16 56 45.66
Tues.	7	16 51 53.02	10.924	22 31 42.3	-17.75	8 49.20	1.068	17 0 42.22
Wed.	8	16 56 15.47	10.945	22 38 35.2	16.65	8 23.31	1.089	17 4 38.78
Thur.	9	17 0 38.40	10.965	22 45 1.4	15.54	7 56.94	1.108	17 8 35.34
Fri.	10	17 5 1.78	10.983	22 51 0.8	-14.41	7 30.12	1.126	17 12 31.89
Sat.	11	17 9 25.57	11.000	22 56 33.1	13.28	7 2.88	1.143	17 16 28.45
SUN.	12	17 13 49.75	11.015	23 1 38.2	12.14	6 35.26	1.158	17 20 25.01
Mon.	13	17 18 14.29	11.029	23 6 15.9	-11.00	6 7.28	1.172	17 24 21.57
Tues.	14	17 22 39.15	11.042	23 10 26.0	9.85	5 38.98	1.185	17 28 18.13
Wed.	15	17 27 4.30	11.053	23 14 8.6	8.69	5 10.39	1.197	17 32 14.69
Thur.	16	17 31 29.71	11.063	23 17 23.3	- 7.53	4 41.53	1.207	17 36 11.25
Fri.	17	17 35 55.36	11.073	23 20 10.1	6.37	4 12.44	1.216	17 40 7.80
Sat.	18	17 40 21.21	11.081	23 22 29.0	5.20	3 43.15	1.224	17 44 4.36
SUN.	19	17 44 47.23	11.087	23 24 19.8	- 4.03	3 13.69	1.231	17 48 0.92
Mon.	20	17 49 13.39	11.092	23 25 42.5	2.86	2 44.09	1.236	17 51 57.48
Tues.	21	17 53 39.67	11.096	23 26 37.0	1.68	2 14.37	1.240	17 55 54.04
Wed.	22	17 58 6.02	11.099	23 27 3.4	- 0.51	1 44.58	1.243	17 59 50.60
Thur.	23	18 2 32.43	11.101	23 27 1.4	+ 0.67	1 14.73	1.244	18 3 47.16
Fri.	24	18 6 58.85	11.101	23 26 31.2	1.85	0 44.87	1.244	18 7 43.72
Sat.	25	18 11 25.26	11.099	23 25 32.8	+ 3.02	0 15.02	1.243	18 11 40.28
SUN.	26	18 15 51.62	11.097	23 24 6.1	4.20	0 14.79	1.240	18 15 36.84
Mon.	27	18 20 17.92	11.093	23 22 11.2	5.38	0 44.52	1.237	18 19 33.39
Tues.	28	18 24 44.10	11.088	23 19 48.0	+ 6.55	1 14.15	1.232	18 23 29.95
Wed.	29	18 29 10.15	11.082	23 16 56.8	7.72	1 43.64	1.225	18 27 26.51
Thur.	30	18 33 36.03	11.074	23 13 37.5	8.89	2 12.96	1.217	18 31 23.07
Fri.	31	18 38 1.70	11.065	23 9 50.2	10.05	2 42.07	1.208	18 35 19.63
Sat.	32	18 42 27.14	11.054	S. 23 5 35.0	+11.21	3 10.95	1.198	18 39 16.19

NOTE.—The semidiameter for mean noon may be assumed the same as that for apparent noon.  
The sign — prefixed to the hourly change of declination indicates that south declinations are increasing; the sign + indicates that south declinations are decreasing.

Diff. for 1 Hour,  
+9°.8565.  
(Table III.)



Day of the Month.	THE MOON'S								
	SEMIDIAMETER.		HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.
	Noon.	Midnight.	Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.
	' "	' "	' "	"	' "	"	h m	m	d
1	15 43.5	15 51.4	57 36.77	+2.383	58 5.73	+2.437	19 43.2	1.98	24.2
2	15 59.4	16 7.3	58 35.08	2.446	59 4.23	2.402	20 32.5	2.15	25.2
3	16 15.0	16 22.3	59 32.49	2.298	59 59.14	2.134	21 26.6	2.37	26.2
4	16 28.9	16 34.7	60 23.45	+1.907	60 44.67	+1.619	22 26.3	2.60	27.2
5	16 39.4	16 43.0	61 2.10	1.277	61 15.16	0.893	23 31.1	2.77	28.2
6	16 45.2	16 46.1	61 23.41	+0.478	61 26.56	+0.045	0	.	29.2
7	16 45.5	16 43.6	61 24.48	−0.389	61 17.29	−0.804	0 38.6	2.81	0.7
8	16 40.3	16 35.9	61 5.32	1.185	60 49.03	1.521	1 45.0	2.70	1.7
9	16 30.4	16 24.1	60 29.02	1.805	60 5.95	2.030	2 47.3	2.48	2.7
10	16 17.2	16 9.9	59 40.55	−2.193	59 13.56	−2.296	3 43.9	2.24	3.7
11	16 2.3	15 54.6	58 45.66	2.345	58 17.49	2.343	4 35.1	2.04	4.7
12	15 47.0	15 39.6	57 49.61	2.298	57 22.49	2.217	5 22.1	1.90	5.7
13	15 32.5	15 25.8	56 56.51	−2.108	56 31.98	−1.978	6 6.5	1.81	6.7
14	15 19.6	15 13.9	56 9.11	1.832	55 48.05	1.676	6 49.6	1.78	7.7
15	15 8.6	15 4.0	55 28.91	1.514	55 11.73	1.350	7 32.6	1.81	8.7
16	14 59.8	14 56.2	54 56.50	−1.189	54 43.17	−1.033	8 16.6	1.86	9.7
17	14 53.0	14 50.4	54 31.69	0.881	54 22.00	0.734	9 2.2	1.95	10.7
18	14 48.2	14 46.5	54 14.03	0.596	54 7.66	0.467	9 50.0	2.03	11.7
19	14 45.2	14 44.2	54 2.79	−0.345	53 59.37	−0.227	10 39.6	2.09	12.7
20	14 43.7	14 43.5	53 57.33	−0.114	53 56.61	−0.007	11 30.3	2.12	13.7
21	14 43.6	14 44.1	53 57.15	+0.097	53 58.94	+0.202	12 21.0	2.10	14.7
22	14 45.0	14 46.1	54 2.00	+0.308	54 6.34	+0.415	13 10.6	2.03	15.7
23	14 47.7	14 49.6	54 11.97	0.524	54 18.94	0.639	13 58.4	1.95	16.7
24	14 51.9	14 54.6	54 27.32	0.759	54 37.18	0.886	14 44.1	1.86	17.7
25	14 57.7	15 1.2	54 48.60	+1.018	55 1.64	+1.156	15 27.9	1.80	18.7
26	15 5.2	15 9.7	55 16.36	1.298	55 32.79	1.441	16 10.6	1.77	19.7
27	15 14.6	15 20.1	55 50.95	1.585	56 10.83	1.727	16 53.1	1.79	20.7
28	15 25.9	15 32.2	56 32.38	+1.862	56 55.48	+1.985	17 36.7	1.86	21.7
29	15 38.9	15 45.9	57 19.95	2.090	57 45.54	2.171	18 22.6	1.99	22.7
30	15 53.1	16 0.4	58 11.93	2.222	58 38.72	2.236	19 12.4	2.18	23.7
31	16 7.6	16 14.7	59 5.43	2.206	59 31.47	2.125	20 7.3	2.40	24.7
32	16 21.5	16 27.7	59 56.21	+1.989	60 18.98	+1.795	21 7.7	2.63	25.7



MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

MEAN TIME.

THE MOON'S RIGHT

AND DECLINATION.

## MEAN TIME.

## THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
MONDAY 13.					WEDNESDAY 15.				
0	23 20 4.11	1.9373	S. 0 36 43.2	14.795	0	0 51 37.79	1.9074	N. 10 39 30.4	13.073
1	23 22 0.27	1.9348	0 21 56.0	14.778	1	0 53 32.27	1.9086	10 52 33.2	13.018
2	23 23 56.28	1.9323	S. 0 7 9.8	14.762	2	0 55 26.82	1.9098	11 5 32.6	12.963
3	23 25 52.15	1.9300	N. 0 7 35.4	14.743	3	0 57 21.44	1.9110	11 18 28.7	12.907
4	23 27 47.88	1.9278	0 22 19.4	14.724	4	0 59 16.14	1.9124	11 31 21.4	12.849
5	23 29 43.48	1.9255	0 37 2.3	14.705	5	1 1 10.93	1.9138	11 44 10.6	12.791
6	23 31 38.94	1.9233	0 51 44.0	14.684	6	1 3 5.80	1.9153	11 56 56.3	12.733
7	23 33 34.28	1.9214	1 6 24.4	14.663	7	1 5 0.76	1.9168	12 9 38.5	12.674
8	23 35 29.51	1.9196	1 21 3.5	14.640	8	1 6 55.82	1.9184	12 22 17.2	12.614
9	23 37 24.63	1.9178	1 35 41.2	14.617	9	1 8 50.97	1.9200	12 34 52.2	12.553
10	23 39 19.64	1.9159	1 50 17.5	14.593	10	1 10 46.22	1.9218	12 47 23.6	12.492
11	23 41 14.54	1.9143	2 4 52.3	14.568	11	1 12 41.58	1.9235	12 59 51.2	12.430
12	23 43 9.35	1.9128	2 19 25.6	14.542	12	1 14 37.04	1.9253	13 12 15.1	12.367
13	23 45 4.07	1.9113	2 33 57.3	14.514	13	1 16 32.61	1.9272	13 24 35.2	12.303
14	23 46 58.70	1.9098	2 48 27.3	14.487	14	1 18 28.30	1.9291	13 36 51.5	12.239
15	23 48 53.25	1.9085	3 2 55.7	14.458	15	1 20 24.10	1.9310	13 49 3.9	12.173
16	23 50 47.72	1.9072	3 17 22.3	14.428	16	1 22 20.02	1.9330	14 1 12.3	12.108
17	23 52 42.11	1.9060	3 31 47.1	14.398	17	1 24 16.06	1.9351	14 13 16.8	12.042
18	23 54 36.44	1.9050	3 46 10.1	14.368	18	1 26 12.23	1.9372	14 25 17.3	11.974
19	23 56 30.71	1.9040	4 0 31.2	14.336	19	1 28 8.52	1.9393	14 37 13.7	11.906
20	23 58 24.92	1.9031	4 14 50.4	14.303	20	1 30 4.95	1.9416	14 49 6.0	11.838
21	0 0 19.08	1.9022	4 29 7.6	14.270	21	1 32 1.51	1.9438	15 0 54.2	11.768
22	0 2 13.18	1.9013	4 43 22.8	14.236	22	1 33 58.21	1.9463	15 12 38.1	11.697
23	0 4 7.24	1.9006	N. 4 57 35.9	14.201	23	1 35 55.05	1.9485	N. 15 24 17.8	11.627
TUESDAY 14.					THURSDAY 16.				
0	0 6 1.27	1.9002	N. 5 11 46.9	14.165	0	1 37 52.03	1.9509	N. 15 35 53.3	11.555
1	0 7 55.26	1.8996	5 25 55.7	14.138	1	1 39 49.16	1.9533	15 47 24.4	11.483
2	0 9 49.22	1.8992	5 40 2.2	14.090	2	1 41 46.43	1.9558	15 58 51.2	11.409
3	0 11 43.16	1.8988	5 54 6.5	14.033	3	1 43 43.86	1.9584	16 10 13.5	11.335
4	0 13 37.07	1.8984	6 8 8.5	14.013	4	1 45 41.44	1.9610	16 21 31.4	11.261
5	0 15 30.97	1.8983	6 22 8.1	13.973	5	1 47 39.18	1.9636	16 32 44.8	11.186
6	0 17 24.86	1.8981	6 36 5.3	13.933	6	1 49 37.07	1.9662	16 43 53.7	11.109
7	0 19 18.74	1.8979	6 50 0.1	13.893	7	1 51 35.12	1.9689	16 54 57.9	11.033
8	0 21 12.61	1.8979	7 3 52.3	13.849	8	1 53 33.34	1.9717	17 5 57.5	10.955
9	0 23 6.49	1.8981	7 17 42.0	13.807	9	1 55 31.72	1.9744	17 16 52.5	10.877
10	0 25 0.38	1.8983	7 31 29.1	13.763	10	1 57 30.27	1.9772	17 27 42.7	10.798
11	0 26 54.28	1.8984	7 45 13.6	13.718	11	1 59 28.98	1.9800	17 38 28.2	10.718
12	0 28 48.19	1.8987	7 58 55.3	13.673	12	2 1 27.87	1.9829	17 49 8.8	10.637
13	0 30 42.12	1.8990	8 12 34.3	13.628	13	2 3 26.93	1.9858	17 59 44.6	10.556
14	0 32 36.07	1.8994	8 26 10.6	13.581	14	2 5 26.16	1.9887	18 10 15.5	10.473
15	0 34 30.05	1.8999	8 39 44.0	13.533	15	2 7 25.57	1.9917	18 20 41.4	10.391
16	0 36 24.06	1.9005	8 53 14.6	13.485	16	2 9 25.16	1.9947	18 31 2.4	10.308
17	0 38 18.11	1.9012	9 6 42.2	13.436	17	2 11 24.93	1.9977	18 41 18.3	10.223
18	0 40 12.20	1.9018	9 20 6.9	13.387	18	2 13 24.88	2.0007	18 51 29.2	10.138
19	0 42 6.33	1.9026	9 33 28.6	13.336	19	2 15 25.01	2.0038	19 1 34.9	10.053
20	0 44 0.51	1.9034	9 46 47.2	13.285	20	2 17 25.33	2.0069	19 11 35.5	9.966
21	0 45 54.74	1.9043	10 0 2.8	13.233	21	2 19 25.84	2.0100	19 21 30.8	9.878
22	0 47 49.03	1.9053	10 13 15.2	13.180	22	2 21 26.53	2.0131	19 31 20.9	9.791
23	0 49 43.38	1.9063	10 26 24.4	13.127	23	2 23 27.41	2.0163	19 41 5.7	9.703
24	0 51 37.79	1.9074	N. 10 39 30.4	13.073	24	2 25 28.48	2.0194	N. 19 50 45.2	9.613

G

MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

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MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

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THE MOON'S RIGHT ASCENSION AND DECLINATION.

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.	Hour.	Right Ascension.	Diff. for 1 Min.	Declination.	Diff. for 1 Min.
WEDNESDAY 29.				FRIDAY 31.				
h m s	s	° ' "	"	h m s	s	° ' "	"	
12 15 42.50	1.9897	S. 6 31 11.2	14.626	0 13 57 52.64	2.2997	S. 17 35 49.5	12.492	
12 17 42.01	1.9941	6 45 48.4	14.613	1 14 0 10.87	2.3080	17 48 16.5	12.408	
12 19 41.79	1.9986	7 0 24.8	14.600	2 14 2 29.60	2.3164	18 0 38.4	12.322	
12 21 41.84	2.0031	7 15 0.4	14.586	3 14 4 48.84	2.3248	18 12 55.1	12.233	
12 23 42.16	2.0078	7 29 35.1	14.570	4 14 7 8.58	2.3333	18 25 6.4	12.143	
12 25 42.77	2.0126	7 44 8.8	14.553	5 14 9 28.84	2.3419	18 37 12.2	12.050	
12 27 43.67	2.0174	7 58 41.5	14.536	6 14 11 49.61	2.3504	18 49 12.4	11.956	
12 29 44.86	2.0223	8 13 13.1	14.517	7 14 14 10.89	2.3590	19 1 6.9	11.860	
12 31 46.35	2.0274	8 27 43.5	14.496	8 14 16 32.69	2.3677	19 12 55.6	11.763	
12 33 48.15	2.0326	8 42 12.6	14.474	9 14 18 55.01	2.3764	19 24 38.4	11.663	
12 35 50.26	2.0378	8 56 40.4	14.452	10 14 21 17.86	2.3852	19 36 15.1	11.560	
12 37 52.68	2.0431	9 11 6.8	14.428	11 14 23 41.23	2.3939	19 47 45.6	11.455	
12 39 55.43	2.0485	9 25 31.7	14.402	12 14 26 5.13	2.4028	19 59 9.7	11.349	
12 41 58.50	2.0540	9 39 55.0	14.375	13 14 28 29.56	2.4115	20 10 27.5	11.242	
12 44 1.91	2.0596	9 54 16.7	14.348	14 14 30 54.51	2.4203	20 21 38.7	11.131	
12 46 5.65	2.0653	10 8 36.7	14.318	15 14 33 19.99	2.4292	20 32 43.2	11.018	
12 48 9.74	2.0710	10 22 54.8	14.287	16 14 35 46.01	2.4381	20 43 40.9	10.904	
12 50 14.17	2.0768	10 37 11.1	14.255	17 14 38 12.56	2.4469	20 54 31.7	10.788	
12 52 18.96	2.0828	10 51 25.4	14.221	18 14 40 39.64	2.4558	21 5 15.4	10.668	
12 54 24.10	2.0888	11 5 37.6	14.186	19 14 43 7.25	2.4647	21 15 51.9	10.548	
12 56 29.61	2.0949	11 19 47.7	14.149	20 14 45 35.40	2.4736	21 26 21.2	10.426	
12 58 35.49	2.1012	11 33 55.5	14.112	21 14 48 4.08	2.4824	21 36 43.0	10.301	
13 0 41.75	2.1075	11 48 1.1	14.073	22 14 50 33.29	2.4913	21 46 57.3	10.174	
13 2 48.39	2.1138	S. 12 2 4.3	14.033	23 14 53 3.03	2.5002	S. 21 57 3.9	10.045	
THURSDAY 30.				SATURDAY, JANUARY 1, 1916.				
13 4 55.41	2.1203	S. 12 16 5.0	13.990	0 14 55 33.31	2.5091	S. 22 7 2.7	9.914	
13 7 2.83	2.1269	12 30 3.1	13.947					
13 9 10.64	2.1335	12 43 58.6	13.902					
13 11 18.85	2.1403	12 57 51.3	13.855					
13 13 27.47	2.1472	13 11 41.2	13.807					
13 15 36.51	2.1541	13 25 28.1	13.757					
13 17 45.96	2.1610	13 39 12.0	13.705					
13 19 55.83	2.1681	13 52 52.7	13.652					
13 22 6.13	2.1753	14 6 30.2	13.598					
13 24 16.86	2.1824	14 20 4.4	13.542					
13 26 28.02	2.1898	14 33 35.2	13.484					
13 28 39.63	2.1972	14 47 2.5	13.424					
13 30 51.68	2.2046	15 0 26.1	13.363					
13 33 4.18	2.2122	15 13 46.0	13.300					
13 35 17.14	2.2198	15 27 2.1	13.236					
13 37 30.56	2.2275	15 40 14.3	13.169					
13 39 44.44	2.2352	15 53 22.4	13.101					
13 41 58.78	2.2430	16 6 26.4	13.032					
13 44 13.60	2.2510	16 19 26.2	12.960					
13 46 28.90	2.2589	16 32 21.6	12.886					
13 48 44.67	2.2669	16 45 12.5	12.811					
13 51 0.93	2.2751	16 57 58.9	12.734					
13 53 17.68	2.2832	17 10 40.6	12.655					
13 55 34.91	2.2913	17 23 17.5	12.574					
13 57 52.64	2.2997	S. 17 35 49.5	12.492					

33281°—1915—10

PHASES OF THE MOON.

	d	h	m
● New Moon . . . . .	Dec.	6	6 3.7
☾ First Quarter . . . . .		12	23 38.4
○ Full Moon . . . . .		21	0 52.3
☾ Last Quarter . . . . .		29	0 58.8

	d	h
☾ Perigee . . . . .	Dec.	6 13.3
☾ Apogee . . . . .		20 12.6



MERCURY, 1915.  
GREENWICH MEAN TIME.

564

**NOTE.**—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing or south declinations decreasing; the sign — indicates that south declinations are increasing.

**MERCURY, 1915.**  
**GREENWICH MEAN TIME.**

**2447**

**NOTE.**—The sign + indicates north declinations.

## GREENWICH MEAN TIME.

**NOTE.**—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing; the sign - indicates that north declinations are decreasing.

MERCURY, 1915.  
GREENWICH MEAN TIME.

## GREENWICH MEAN TIME.



**NOTE.**—The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing; the sign — indicates that north declinations are decreasing or south declinations increasing.

**VENUS, 1915.**  
**GREENWICH MEAN TIME.**

27

273000

**NOTE.**—The sign + indicates north declinations; the sign — indicates south declinations.

**GREENWICH MEAN TIME.**

**NOTE.**—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing or south declinations decreasing. The sign - indicates that south declinations are increasing.



1915

NOTE.—The sign + indicates north declinations.

## GREENWICH MEAN TIME.

### JULY.

### AUGUST.

Day of Month.	Apparent Right Ascension.		Var. of R. A. for 1 Hour.		Apparent Declination.		Var. of Decl. for 1 Hour.		Meridian Passage.	Day of Month.	Apparent Right Ascension.		Var. of R. A. for 1 Hour.		Apparent Declination.		Var. of Decl. for 1 Hour.		Meridian Passage.
	h	m	s	"	h	m	s	"			h	m	s	"	h	m	s	"	
1	5	11	23.07	+13.049	+22	18	45.4	+21.35	22 38.8	1	7	55	8.19	+13.022	+21	25	36.8	-29.92	23 20.2
2	5	16	36.62	13.080	22	26	58.9	19.78	22 40.1	2	8	0	20.34	12.990	21	13	19.9	31.48	23 21.5
3	5	21	50.88	13.108	22	34	34.6	18.19	22 41.4	3	8	5	31.71	12.957	21	0	25.9	33.02	23 22.8
4	5	27	5.81	13.135	22	41	32.0	16.59	22 42.7	4	8	10	42.27	12.922	20	46	55.2	34.54	23 24.0
5	5	32	21.37	13.161	22	47	50.9	14.98	22 44.0	5	8	15	51.97	12.886	20	32	48.3	36.03	23 25.2
6	5	37	37.52	+13.184	+22	53	30.9	+13.35	22 45.3	6	8	21	0.79	+12.849	+20	18	5.7	-37.51	23 26.4
7	5	42	54.20	13.205	22	58	31.6	11.70	22 46.7	7	8	26	8.71	12.811	20	2	47.9	38.97	23 27.6
8	5	48	11.35	13.223	23	2	52.6	10.05	22 48.1	8	8	31	15.71	12.772	19	46	55.4	40.40	23 28.7
9	5	53	28.92	13.240	23	6	33.9	8.39	22 49.4	9	8	36	21.75	12.732	19	30	28.8	41.81	23 29.8
10	5	58	46.88	13.255	23	9	35.2	6.72	22 50.7	10	8	41	26.82	12.691	19	13	28.6	43.20	23 31.0
11	6	4	5.17	+13.268	+23	11	56.3	+5.04	22 52.1	11	8	46	30.89	+12.649	+18	55	55.4	-44.56	23 32.1
12	6	9	23.72	13.278	23	13	36.9	3.35	22 53.5	12	8	51	33.96	12.606	18	37	49.9	45.90	23 33.2
13	6	14	42.49	13.286	23	14	37.0	+1.66	22 54.9	13	8	56	36.00	12.563	18	19	12.6	47.21	23 34.3
14	6	20	1.41	13.291	23	14	56.4	-0.04	22 56.3	14	9	1	37.01	12.520	18	0	4.2	48.49	23 35.4
15	6	25	20.44	13.294	23	14	35.1	1.74	22 57.6	15	9	6	36.98	12.477	17	40	25.2	49.75	23 36.4
16	6	30	39.51	+13.295	+23	13	33.0	-3.44	22 59.0	16	9	11	35.90	+12.433	+17	20	16.4	-50.98	23 37.4
17	6	35	58.57	13.295	23	11	50.0	5.14	23 0.4	17	9	16	33.77	12.389	16	59	38.4	52.18	23 38.4
18	6	41	17.56	13.289	23	9	26.2	6.84	23 1.8	18	9	21	30.60	12.345	16	38	31.8	53.36	23 39.4
19	6	46	36.43	13.283	23	6	21.7	8.54	23 3.1	19	9	26	26.37	12.302	16	16	57.3	54.51	23 40.4
20	6	51	55.13	13.275	23	2	36.5	10.23	23 4.4	20	9	31	21.09	12.259	15	54	55.6	55.63	23 41.3
21	6	57	13.60	+13.264	+22	58	10.6	-11.92	23 5.8	21	9	36	14.78	+12.216	+15	32	27.4	-56.72	23 42.3
22	7	2	31.79	13.252	22	53	4.2	13.60	23 7.2	22	9	41	7.44	12.173	15	9	33.3	57.78	23 43.3
23	7	7	49.66	13.237	22	47	17.5	15.28	23 8.5	23	9	45	59.08	12.131	14	46	14.0	58.82	23 44.1
24	7	13	7.15	13.220	22	40	50.6	16.96	23 9.8	24	9	50	49.72	12.090	14	22	30.1	59.83	23 45.0
25	7	18	24.21	13.201	22	33	43.6	18.62	23 11.2	25	9	55	39.38	12.049	13	58	22.4	60.81	23 45.9
26	7	23	40.80	+13.181	+22	25	56.9	-20.27	23 12.6	26	10	0	28.07	+12.009	+13	33	51.5	-61.76	23 46.7
27	7	28	56.89	13.159	22	17	30.7	21.91	23 13.9	27	10	5	15.81	11.970	13	8	58.2	62.68	23 47.5
28	7	34	12.42	13.135	22	8	25.2	23.54	23 15.2	28	10	10	2.62	11.932	12	43	43.1	63.57	23 48.4
29	7	39	27.36	13.110	21	58	40.7	25.16	23 16.5	29	10	14	48.52	11.894	12	18	7.0	64.43	23 49.2
30	7	44	41.66	13.082	21	48	17.6	26.76	23 17.8	30	10	19	33.53	11.851	11	52	10.5	65.26	23 50.0
31	7	49	55.28	+13.053	+21	37	16.2	-28.35	23 19.0	31	10	24	17.68	+11.812	+11	25	54.3	-66.07	23 50.8
32	7	55	8.19	+13.022	+21	25	36.8	-29.92	23 20.2	32	10	29	1.00	+11.768	+10	59	19.2	-66.85	23 51.5

Day of the Month.	5th.	10th.	15th.	20th.	25th.	30th.
Declination	5.32	5.26	5.21	5.17	5.13	5.09
Horizontal Parallax	5.48	5.42	5.37	5.32	5.28	5.24
Ser						
Ho						

NOTE.—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing; the sign - indicates that north declinations are decreasing.



## GREENWICH MEAN TIME.

\* \*

MAY

JULY

SEP.

NOTE.—The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing; the sign — indicates that north declinations are decreasing or south declinations increasing.

1915

NOTE.—The sign + indicates north declinations; the sign — indicates south declinations.

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**MARS, 1915.**  
**GREENWICH MEAN TIME.**

2.4

2.4

**NOTE.**—The sign + indicates north declinations.

## GREENWICH MEAN TIME.

**NOTE.**—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing; the sign - indicates that north declinations are decreasing.



**MARS, 1915.**  
**GREENWICH MEAN TIME.**

**IN** 

**NOTE.**—The sign + indicates north declination.

GREENWICH MEAN TIME.

**JUPITER, 1915.**  
**GREENWICH MEAN TIME.**



GREENWICH MEAN TIME.

MARCH.						APRIL.					
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Meridian Passage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Meridian Passage.
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.	
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h m
1	22 32 54.33	+2.278	-10 6 53.3	+13.20	23 0 0.1	1	23 0 23.40	+2.126	-7 23 50.3	+12.84	22 22.5
2	22 33 48.96	2.276	10 1 36.3	13.21	23 54.0	2	23 1 14.32	2.118	7 18 42.5	12.81	22 19.4
3	22 34 43.54	2.273	9 56 19.0	13.22	23 51.0	3	23 2 5.05	2.110	7 13 35.5	12.77	22 16.3
4	22 35 38.06	2.271	9 51 1.5	13.23	23 48.0	4	23 2 55.58	2.102	7 8 29.4	12.73	22 13.2
5	22 36 32.53	2.268	9 45 43.8	13.24	23 44.9	5	23 3 45.91	2.094	7 3 24.3	12.69	22 10.1
6	22 37 26.93	+2.265	- 9 40 25.9	+13.24	23 41.9	6	23 4 36.05	+2.085	-6 58 20.2	+12.65	22 7.0
7	22 38 21.26	2.262	9 35 7.9	13.25	23 38.9	7	23 5 25.98	2.076	6 53 17.0	12.61	22 3.9
8	22 39 15.52	2.259	9 29 49.8	13.25	23 35.8	8	23 6 15.71	2.067	6 48 14.9	12.57	22 0.8
9	22 40 9.70	2.255	9 24 31.6	13.26	23 32.8	9	23 7 5.22	2.058	6 43 13.9	12.52	21 57.6
10	22 41 3.80	2.252	9 19 13.5	13.26	23 29.7	10	23 7 54.51	2.049	6 38 14.0	12.47	21 54.5
11	22 41 57.81	+2.248	- 9 13 55.4	+13.25	23 26.7	11	23 8 43.58	+2.040	-6 33 15.4	+12.42	21 51.4
12	22 42 51.72	2.244	9 8 37.4	13.25	23 23.7	12	23 9 32.42	2.030	6 28 18.0	12.37	21 48.3
13	22 43 45.54	2.240	9 3 19.4	13.24	23 20.6	13	23 10 21.02	2.020	6 23 21.8	12.32	21 45.1
14	22 44 39.26	2.236	8 58 1.6	13.24	23 17.6	14	23 11 9.38	2.010	6 18 27.0	12.26	21 42.0
15	22 45 32.87	2.232	8 52 44.0	13.23	23 14.6	15	23 11 57.49	2.000	6 13 33.6	12.20	21 38.9
16	22 46 26.37	+2.227	- 8 47 26.6	+13.22	23 11.5	16	23 12 45.35	+1.990	-6 8 41.6	+12.14	21 35.7
17	22 47 19.75	2.222	8 42 9.5	13.21	23 8.5	17	23 13 32.95	1.979	6 3 51.0	12.08	21 32.6
18	22 48 13.01	2.217	8 36 52.7	13.20	23 5.4	18	23 14 20.30	1.968	5 59 1.9	12.01	21 29.4
19	22 49 6.15	2.212	8 31 36.2	13.18	23 2.4	19	23 15 7.38	1.957	5 54 14.4	11.95	21 26.3
20	22 49 59.16	2.206	8 26 20.1	13.16	22 59.3	20	23 15 54.19	1.946	5 49 28.4	11.88	21 23.1
21	22 50 52.03	+2.200	- 8 21 4.4	+13.14	22 56.3	21	23 16 40.73	+1.934	-5 44 44.0	+11.81	21 20.0
22	22 51 44.75	2.194	8 15 49.2	13.12	22 53.2	22	23 17 26.98	1.922	5 40 1.3	11.74	21 16.8
23	22 52 37.33	2.188	8 10 34.5	13.10	22 50.1	23	23 18 12.95	1.910	5 35 20.3	11.67	21 13.6
24	22 53 29.76	2.182	8 5 20.4	13.08	22 47.1	24	23 18 58.63	1.898	5 30 41.0	11.60	21 10.4
25	22 54 22.04	2.176	8 0 6.8	13.05	22 44.0	25	23 19 44.01	1.886	5 26 3.4	11.53	21 7.2
26	22 55 14.17	+2.170	- 7 54 53.8	+13.03	22 40.9	26	23 20 29.10	+1.873	-5 21 27.6	+11.45	21 4.0
27	22 56 6.13	2.163	7 49 41.4	13.00	22 37.9	27	23 21 13.89	1.860	5 16 53.7	11.38	21 0.8
28	22 56 57.93	2.156	7 44 29.7	12.97	22 34.8	28	23 21 58.38	1.847	5 12 21.6	11.30	20 57.6
29	22 57 49.56	2.148	7 39 18.7	12.94	22 31.7	29	23 22 42.55	1.834	5 7 51.4	11.22	20 54.4
30	22 58 41.02	2.141	7 34 8.5	12.91	22 28.6	30	23 23 26.41	1.821	5 3 23.2	11.14	20 51.2
31	22 59 32.30	+2.133	- 7 28 59.0	+12.88	22 25.5	31	23 24 9.95	+1.808	-4 58 56.9	+11.06	20 48.0
32	23 0 23.40	+2.126	- 7 23 50.3	+12.84	22 22.5	32	23 24 53.17	+1.794	-4 54 32.6	+10.97	20 44.8
Day of the Month.						Day of the Month.					
5th.						6th.					
18th.						14th.					
21st.						22d.					
29th.						30th.					
Semidiameter . . .						Semidiameter . . .					
Horizontal Parallax						Horizontal Parallax					
15.73						16.16					
1.47						1.51					
15.79						16.36					
1.48						1.53					
15.88						16.59					
1.48						1.55					
16.00						16.86					
1.49						1.58					

NOTE.—The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing.

**JUPITER, 1915.**  
**GREENWICH MEAN TIME.**

417

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**NOTE.**—The sign — indicates south declinations.

## GREENWICH MEAN TIME.



GREENWICH MEAN TIME.

SEPTEMBER.						OCTOBER.											
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.						
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.							
	h m s	s	° ' "	"			h m	h m s	s	° ' "		"	h m				
1	23 46 12.44	-1.100	-3 11 5.9	-7.55	13 5.6	1	23 31 56.30	-1.141	-4 44 44.2	-7.17	10 53.4						
2	23 45 45.86	1.114	3 14 7.9	7.62	13 1.2	2	23 31 29.05	1.129	4 47 35.0	7.07	10 49.0						
3	23 45 18.95	1.128	3 17 11.7	7.69	12 56.8	3	23 31 2.11	1.116	4 50 23.3	6.96	10 44.7						
4	23 44 51.73	1.141	3 20 17.0	7.75	12 52.4	4	23 30 35.51	1.102	4 53 8.9	6.85	10 40.3						
5	23 44 24.20	1.153	3 23 23.8	7.81	12 48.0	5	23 30 9.25	1.087	4 55 51.8	6.73	10 35.9						
6	23 43 56.39	-1.164	-3 26 31.9	-7.86	12 43.6	6	23 29 43.36	-1.071	-4 58 31.8	-6.61	10 31.6						
7	23 43 28.33	1.174	3 29 41.2	7.91	12 39.2	7	23 29 17.87	1.054	5 1 8.7	6.48	10 27.2						
8	23 43 0.04	1.183	3 32 51.5	7.95	12 34.8	8	23 28 52.79	1.036	5 3 42.5	6.35	10 22.9						
9	23 42 31.54	1.191	3 36 2.6	7.98	12 30.4	9	23 28 28.15	1.018	5 6 13.1	6.21	10 18.5						
10	23 42 2.85	1.198	3 39 14.5	8.00	12 26.0	10	23 28 3.96	0.999	5 8 40.3	6.07	10 14.2						
11	23 41 33.99	-1.204	-3 42 26.9	-8.02	12 21.6	11	23 27 40.23	-0.979	-5 11 4.1	-5.92	10 9.8						
12	23 41 4.99	1.210	3 45 39.7	8.03	12 17.2	12	23 27 16.99	0.958	5 13 24.3	5.77	10 5.5						
13	23 40 35.87	1.215	3 48 52.7	8.04	12 12.8	13	23 26 54.25	0.937	5 15 40.9	5.61	10 1.2						
14	23 40 6.65	1.218	3 52 5.8	8.04	12 8.3	14	23 26 32.02	0.915	5 17 53.7	5.45	9 56.9						
15	23 39 37.36	1.221	3 55 18.8	8.04	12 3.9	15	23 26 10.33	0.892	5 20 2.7	5.29	9 52.6						
16	23 39 8.02	-1.223	-3 58 31.6	-8.03	11 59.5	16	23 25 49.21	-0.869	-5 22 7.7	-5.13	9 48.3						
17	23 38 38.64	1.224	4 1 44.1	8.01	11 55.1	17	23 25 28.65	0.845	5 24 8.7	4.96	9 44.1						
18	23 38 9.26	1.224	4 4 56.1	7.99	11 50.7	18	23 25 8.67	0.821	5 26 5.6	4.79	9 39.8						
19	23 37 39.89	1.223	4 8 7.5	7.96	11 46.3	19	23 24 49.27	0.796	5 27 58.4	4.61	9 35.6						
20	23 37 10.55	1.221	4 11 18.1	7.92	11 41.9	20	23 24 30.47	0.771	5 29 47.0	4.44	9 31.3						
21	23 36 41.27	-1.218	-4 14 27.7	-7.88	11 37.4	21	23 24 12.28	-0.745	-5 31 31.3	-4.26	9 27.1						
22	23 36 12.07	1.214	4 17 36.3	7.83	11 33.0	22	23 23 54.72	0.719	5 33 11.3	4.08	9 22.9						
23	23 35 42.97	1.209	4 20 43.7	7.78	11 28.6	23	23 23 37.80	0.692	5 34 46.9	3.89	9 18.7						
24	23 35 13.99	1.204	4 23 49.8	7.72	11 24.2	24	23 23 21.52	0.665	5 36 18.2	3.71	9 14.5						
25	23 34 45.15	1.198	4 26 54.4	7.66	11 19.8	25	23 23 5.90	0.637	5 37 45.0	3.52	9 10.3						
26	23 34 16.48	-1.191	-4 29 57.5	-7.59	11 15.4	26	23 22 50.94	-0.609	-5 39 7.2	-3.33	9 6.1						
27	23 33 47.99	1.183	4 32 58.8	7.52	11 11.0	27	23 22 36.66	0.581	5 40 24.9	3.14	9 2.0						
28	23 33 19.71	1.174	4 35 58.2	7.44	11 6.6	28	23 22 23.06	0.552	5 41 38.0	2.95	8 57.8						
29	23 32 51.66	1.164	4 38 55.7	7.35	11 2.2	29	23 22 10.16	0.523	5 42 46.4	2.75	8 53.7						
30	23 32 23.85	1.153	4 41 51.1	7.26	10 57.8	30	23 21 57.96	0.494	5 43 50.2	2.56	8 49.6						
31	23 31 56.30	-1.141	-4 44 44.2	-7.17	10 53.4	31	23 21 46.46	-0.464	-5 44 49.2	-2.36	8 45.5						
32	23 31 29.05	-1.129	-4 47 35.0	-7.07	10 49.0	32	23 21 35.67	-0.434	-5 45 43.4	-2.16	8 41.4						
Day of the Month.					5th.	18th.	21st.	29th.	Day of the Month.					7th.	15th.	22d.	31st.
Semidiameter . . .					23.64	23.75	23.74	23.62	Semidiameter . . .					23.39	23.06	22.66	22.19
Horizontal Parallax					2.21	2.22	2.22	2.21	Horizontal Parallax					2.19	2.16	2.12	2.07

NOTE.—The sign — indicates south declinations.

JUPITER, 1915.

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GREENWICH MEAN TIME.

NOVEMBER.						DECEMBER.													
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.								
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.									
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h m								
1	23 21 35.67	-0.434	5 45 43.4	-2.16	8 41.4	1	23 22 1.66	+0.504	5 34 54.0	+3.90	6 43.9								
2	23 21 25.61	0.404	5 46 32.8	1.96	8 37.3	2	23 22 14.11	0.534	5 33 18.2	4.09	6 40.2								
3	23 21 16.28	0.374	5 47 17.4	1.76	8 33.2	3	23 22 27.29	0.564	5 31 37.7	4.28	6 36.5								
4	23 21 7.69	0.343	5 47 57.1	1.55	8 29.1	4	23 22 41.18	0.594	5 29 52.7	4.47	6 32.8								
5	23 20 59.83	0.312	5 48 31.9	1.35	8 25.1	5	23 22 55.78	0.623	5 28 3.2	4.66	6 29.1								
6	23 20 52.72	-0.281	5 49 1.8	-1.14	8 21.0	6	23 23 11.09	+0.652	5 26 9.2	+4.84	6 25.4								
7	23 20 46.36	0.250	5 49 26.8	0.94	8 17.0	7	23 23 27.09	0.681	5 24 10.8	5.03	6 21.8								
8	23 20 40.76	0.218	5 49 46.8	0.73	8 13.0	8	23 23 43.79	0.710	5 22 8.0	5.21	6 18.1								
9	23 20 35.92	0.187	5 50 1.8	0.52	8 9.0	9	23 24 1.18	0.738	5 20 0.8	5.39	6 14.5								
10	23 20 31.85	0.155	5 50 11.8	0.31	8 5.0	10	23 24 19.26	0.767	5 17 49.3	5.57	6 10.8								
11	23 20 28.54	-0.123	5 50 16.9	-0.11	8 1.0	11	23 24 38.02	+0.795	5 15 33.5	+5.75	6 7.2								
12	23 20 26.00	0.091	5 50 17.0	+0.10	7 57.0	12	23 24 57.44	0.823	5 13 13.5	5.92	6 3.6								
13	23 20 24.22	0.059	5 50 12.1	0.30	7 53.0	13	23 25 17.53	0.851	5 10 49.3	6.10	6 0.0								
14	23 20 23.20	-0.027	5 50 2.3	0.51	7 49.1	14	23 25 38.27	0.878	5 8 20.9	6.27	5 56.4								
15	23 20 22.95	+0.005	5 49 47.5	0.71	7 45.1	15	23 25 59.66	0.905	5 5 48.5	6.44	5 52.8								
16	23 20 23.47	+0.038	5 49 27.8	+0.92	7 41.2	16	23 26 21.69	+0.931	5 3 12.0	+6.61	5 49.3								
17	23 20 24.75	0.069	5 49 3.2	1.12	7 37.3	17	23 26 44.36	0.957	5 0 31.5	6.77	5 45.7								
18	23 20 26.79	0.100	5 48 33.7	1.33	7 33.4	18	23 27 7.65	0.983	4 57 47.0	6.93	5 42.2								
19	23 20 29.59	0.132	5 47 59.3	1.53	7 29.5	19	23 27 31.56	1.009	4 54 58.7	7.09	5 38.6								
20	23 20 33.15	0.163	5 47 20.1	1.74	7 25.7	20	23 27 56.08	1.034	4 52 6.5	7.25	5 35.1								
21	23 20 37.47	+0.194	5 46 36.1	+1.94	7 21.8	21	23 28 21.20	+1.059	4 49 10.5	+7.41	5 31.6								
22	23 20 42.54	0.226	5 45 47.2	2.14	7 18.0	22	23 28 46.93	1.084	4 46 10.7	7.57	5 28.1								
23	23 20 48.37	0.257	5 44 53.5	2.34	7 14.2	23	23 29 13.25	1.109	4 43 7.1	7.73	5 24.6								
24	23 20 54.95	0.289	5 43 55.0	2.53	7 10.4	24	23 29 40.15	1.133	4 39 59.8	7.88	5 21.1								
25	23 21 2.26	0.320	5 42 51.8	2.73	7 6.6	25	23 30 7.63	1.157	4 36 48.9	8.03	5 17.7								
26	23 21 10.32	+0.351	5 41 43.9	+2.93	7 2.8	26	23 30 35.67	+1.181	4 33 34.4	+8.18	5 14.2								
27	23 21 19.12	0.382	5 40 31.3	3.13	6 59.0	27	23 31 4.28	1.204	4 30 16.3	8.33	5 10.8								
28	23 21 28.66	0.413	5 39 14.0	3.32	6 55.2	28	23 31 33.45	1.227	4 26 54.6	8.47	5 7.3								
29	23 21 38.93	0.443	5 37 52.0	3.52	6 51.4	29	23 32 3.17	1.250	4 23 29.5	8.62	5 3.9								
30	23 21 49.93	0.474	5 36 25.3	3.71	6 47.7	30	23 32 33.44	1.272	4 20 0.9	8.76	5 0.4								
31	23 22 1.66	+0.504	5 34 54.0	+3.90	6 43.9	31	23 33 4.25	+1.295	4 16 28.9	+8.90	4 57.0								
32	23 22 14.11	+0.534	5 33 18.2	+4.09	6 40.2	32	23 33 35.59	+1.317	4 12 53.5	+9.04	4 53.6								
Day of the Month.						8th.	10th.	24th.	Day of Month.						2d.	10th.	18th.	26th.	34th.
						"	"	"							"	"	"	"	"
Semidiameter . . . . .						21.68	21.14	20.60	Semidiam. . . . .						20.06	19.53	19.03	18.56	18.13
Horizontal Parallax . . . . .						2.03	1.98	1.93	Hor. Par. . . . .						1.88	1.83	1.78	1.74	1.70

NOTE.—The sign + prefixed to the hourly change of declination indicates that south declinations are decreasing; the sign — indicates that south declinations are increasing.



GREENWICH MEAN TIME.

JANUARY.						FEBRUARY.					
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.	
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h m
1	5 51 7.53	−0.863	+22 18 51.5	+0.14	11 8.9	1	5 42 23.77	−0.482	+22 21 6.4	+0.26	8 58.4
2	5 50 46.89	0.857	22 18 54.8	0.14	11 4.6	2	5 42 12.42	0.464	22 21 12.8	0.27	8 54.3
3	5 50 26.39	0.851	22 18 58.2	0.14	11 0.4	3	5 42 1.48	0.447	22 21 19.4	0.28	8 50.2
4	5 50 6.05	0.844	22 19 1.5	0.14	10 56.1	4	5 41 50.98	0.429	22 21 26.3	0.29	8 46.1
5	5 49 45.88	0.837	22 19 4.9	0.14	10 51.8	5	5 41 40.91	0.410	22 21 33.3	0.30	8 42.0
6	5 49 25.88	−0.829	+22 19 8.3	+0.14	10 47.6	6	5 41 31.28	−0.392	+22 21 40.6	+0.31	8 37.9
7	5 49 6.08	0.821	22 19 11.7	0.14	10 43.3	7	5 41 22.10	0.373	22 21 48.0	0.32	8 33.8
8	5 48 46.48	0.812	22 19 15.2	0.15	10 39.1	8	5 41 13.37	0.354	22 21 55.7	0.33	8 29.7
9	5 48 27.09	0.803	22 19 18.7	0.15	10 34.8	9	5 41 5.09	0.335	22 22 3.6	0.33	8 25.7
10	5 48 7.93	0.794	22 19 22.3	0.15	10 30.6	10	5 40 57.27	0.316	22 22 11.8	0.34	8 21.6
11	5 47 49.01	−0.784	+22 19 25.9	+0.15	10 26.3	11	5 40 49.92	−0.297	+22 22 20.1	+0.35	8 17.6
12	5 47 30.33	0.773	22 19 29.6	0.16	10 22.1	12	5 40 43.03	0.277	22 22 28.8	0.36	8 13.5
13	5 47 11.90	0.762	22 19 33.4	0.16	10 17.8	13	5 40 36.62	0.257	22 22 37.6	0.37	8 9.5
14	5 46 53.75	0.751	22 19 37.2	0.16	10 13.6	14	5 40 30.68	0.238	22 22 46.7	0.38	8 5.5
15	5 46 35.88	0.739	22 19 41.1	0.17	10 9.4	15	5 40 25.21	0.218	22 22 56.0	0.39	8 1.4
16	5 46 18.29	−0.726	+22 19 45.2	+0.17	10 5.2	16	5 40 20.23	−0.198	+22 23 5.6	+0.40	7 57.4
17	5 46 1.01	0.714	22 19 49.3	0.17	10 0.9	17	5 40 15.73	0.177	22 23 15.4	0.41	7 53.4
18	5 45 44.04	0.701	22 19 53.5	0.18	9 56.7	18	5 40 11.72	0.157	22 23 25.4	0.42	7 49.4
19	5 45 27.39	0.687	22 19 57.8	0.18	9 52.5	19	5 40 8.19	0.137	22 23 35.7	0.43	7 45.4
20	5 45 11.07	0.673	22 20 2.3	0.19	9 48.3	20	5 40 5.15	0.116	22 23 46.2	0.44	7 41.5
21	5 44 55.08	−0.659	+22 20 6.8	+0.19	9 44.1	21	5 40 2.60	−0.096	+22 23 56.9	+0.45	7 37.5
22	5 44 39.45	0.644	22 20 11.5	0.20	9 40.0	22	5 40 0.54	0.076	22 24 7.9	0.46	7 33.5
23	5 44 24.17	0.629	22 20 16.3	0.20	9 35.8	23	5 39 58.96	0.055	22 24 19.1	0.47	7 29.6
24	5 44 9.25	0.614	22 20 21.2	0.21	9 31.6	24	5 39 57.88	0.035	22 24 30.6	0.48	7 25.6
25	5 43 54.70	0.598	22 20 26.3	0.22	9 27.4	25	5 39 57.28	−0.014	22 24 42.3	0.49	7 21.7
26	5 43 40.53	−0.583	+22 20 31.5	+0.22	9 23.3	26	5 39 57.18	+0.007	+22 24 54.2	+0.50	7 17.8
27	5 43 26.74	0.566	22 20 36.9	0.23	9 19.1	27	5 39 57.56	0.027	22 25 6.3	0.51	7 13.8
28	5 43 13.34	0.550	22 20 42.5	0.23	9 14.9	28	5 39 58.43	0.047	22 25 18.7	0.52	7 9.9
29	5 43 0.34	0.533	22 20 48.2	0.24	9 10.8	29	5 39 59.79	0.067	22 25 31.3	0.53	7 6.0
30	5 42 47.74	0.516	22 20 54.0	0.25	9 6.7	30	5 40 1.64	0.087	22 25 44.1	0.54	7 2.1
31	5 42 35.55	−0.499	+22 21 0.1	+0.26	9 2.5	31	5 40 3.97	+0.107	+22 25 57.1	+0.55	6 58.2
32	5 42 23.77	−0.482	+22 21 6.4	+0.26	8 58.4	32	5 40 6.79	+0.127	+22 26 10.3	+0.56	6 54.3
Day of the Month.						Day of the Month.					
1st.						2d.					
9th.						10th.					
17th.						18th.					
25th.						20th.					
Semidiameter . . .						Semidiameter . . .					
Horizontal Parallax						Horizontal Parallax					
9.62						9.32					
1.09						1.06					
9.58						9.21					
1.09						1.05					
9.51						9.09					
1.08						1.03					
9.43						8.96					
1.07						1.02					

NOTE.—The sign + indicates north declinations.

GREENWICH MEAN TIME.

MARCH.						APRIL.					
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Meridian Passage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Meridian Passage.
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.	
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h m
1	5 39 59.79	+0.067	+22 25 31.3	+0.53	7 6.0	1	5 44 36.23	+0.659	+22 33 23.8	+0.69	5 8.8
2	5 40 1.64	0.087	22 25 44.1	0.54	7 2.1	2	5 44 52.23	0.675	22 33 40.4	0.69	5 5.1
3	5 40 3.97	0.107	22 25 57.1	0.55	6 58.2	3	5 45 8.64	0.692	22 33 56.9	0.69	5 1.4
4	5 40 6.79	0.127	22 26 10.3	0.56	6 54.3	4	5 45 25.46	0.709	22 34 13.4	0.69	4 57.8
5	5 40 10.09	0.148	22 26 23.8	0.57	6 50.5	5	5 45 42.66	0.725	22 34 29.9	0.69	4 54.1
6	5 40 13.87	+0.168	+22 26 37.5	+0.57	6 46.6	6	5 46 0.26	+0.741	+22 34 46.4	+0.68	4 50.5
7	5 40 18.14	0.188	22 26 51.3	0.58	6 42.7	7	5 46 18.25	0.758	22 35 2.8	0.68	4 46.9
8	5 40 22.89	0.208	22 27 5.4	0.59	6 38.9	8	5 46 36.63	0.774	22 35 19.1	0.68	4 43.2
9	5 40 28.13	0.228	22 27 19.7	0.60	6 35.0	9	5 46 55.39	0.789	22 35 35.3	0.67	4 39.6
10	5 40 33.84	0.248	22 27 34.1	0.61	6 31.2	10	5 47 14.52	0.805	22 35 51.5	0.67	4 36.0
11	5 40 40.03	+0.268	+22 27 48.7	+0.61	6 27.4	11	5 47 34.03	+0.821	+22 36 7.5	+0.67	4 32.4
12	5 40 46.70	0.288	22 28 3.5	0.62	6 23.6	12	5 47 53.90	0.836	22 36 23.4	0.66	4 28.8
13	5 40 53.84	0.308	22 28 18.5	0.63	6 19.7	13	5 48 14.15	0.851	22 36 39.3	0.66	4 25.2
14	5 41 1.46	0.327	22 28 33.6	0.63	6 15.9	14	5 48 34.75	0.866	22 36 54.9	0.65	4 21.6
15	5 41 9.55	0.347	22 28 48.9	0.64	6 12.1	15	5 48 55.70	0.881	22 37 10.5	0.64	4 18.0
16	5 41 18.11	+0.366	+22 29 4.4	+0.65	6 8.4	16	5 49 17.01	+0.895	+22 37 25.8	+0.64	4 14.5
17	5 41 27.14	0.386	22 29 19.9	0.65	6 4.6	17	5 49 38.66	0.909	22 37 41.0	0.63	4 10.9
18	5 41 36.63	0.405	22 29 35.6	0.66	6 0.8	18	5 50 0.66	0.923	22 37 56.1	0.62	4 7.3
19	5 41 46.58	0.424	22 29 51.4	0.66	5 57.0	19	5 50 22.98	0.937	22 38 10.9	0.61	4 3.8
20	5 41 56.99	0.443	22 30 7.3	0.67	5 53.3	20	5 50 45.64	0.951	22 38 25.6	0.61	4 0.2
21	5 42 7.86	+0.462	+22 30 23.4	+0.67	5 49.5	21	5 51 8.62	+0.964	+22 38 40.0	+0.60	3 56.7
22	5 42 19.17	0.481	22 30 39.5	0.67	5 45.8	22	5 51 31.92	0.977	22 38 54.3	0.59	3 53.1
23	5 42 30.93	0.499	22 30 55.7	0.68	5 42.1	23	5 51 55.54	0.990	22 39 8.3	0.58	3 49.6
24	5 42 43.14	0.518	22 31 12.0	0.68	5 38.3	24	5 52 19.46	1.003	22 39 22.0	0.57	3 46.0
25	5 42 55.78	0.536	22 31 28.3	0.68	5 34.6	25	5 52 43.69	1.016	22 39 35.6	0.56	3 42.5
26	5 43 8.86	+0.554	+22 31 44.7	+0.68	5 30.9	26	5 53 8.22	+1.028	+22 39 48.8	+0.55	3 39.0
27	5 43 22.36	0.572	22 32 1.2	0.69	5 27.2	27	5 53 33.04	1.040	22 40 1.8	0.54	3 35.5
28	5 43 36.30	0.589	22 32 17.7	0.69	5 23.5	28	5 53 58.15	1.052	22 40 14.6	0.52	3 31.9
29	5 43 50.66	0.607	22 32 34.2	0.69	5 19.8	29	5 54 23.54	1.064	22 40 27.0	0.51	3 28.4
30	5 44 5.43	0.624	22 32 50.7	0.69	5 16.1	30	5 54 49.22	1.076	22 40 39.2	0.50	3 24.9
31	5 44 20.62	+0.642	+22 33 7.3	+0.69	5 12.4	31	5 55 15.17	+1.087	+22 40 51.0	+0.49	3 21.4
32	5 44 36.23	+0.659	+22 33 23.8	+0.69	5 8.8	32	5 55 41.39	+1.098	+22 41 2.6	+0.47	3 17.9
Day of the Month.						Day of the Month.					
Semidiameter . . .						Semidiameter . . . . .					
Horizontal Parallax						Horizontal Parallax . . .					
8th.						7th.					
14th.						15th.					
22d.						23d.					
30th.											
8.83						8.33					
8.69						8.22					
8.57						8.12					
0.99						0.95					
0.97						0.93					
0.96						0.92					

NOTE.—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing.

GREENWICH MEAN TIME.

MAY.						JUNE.					
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.	
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h m
1	5 55 15.17	+1.087	+22 40 51.0	+0.49	3 21.4	1	6 10 31.03	+1.342	+22 43 45.6	-0.06	1 34.7
2	5 55 41.39	1.098	22 41 2.6	0.47	3 17.9	2	6 11 3.31	1.347	22 43 43.9	0.08	1 31.3
3	5 56 7.88	1.109	22 41 13.8	0.46	3 14.4	3	6 11 35.71	1.352	22 43 41.7	0.10	1 28.0
4	5 56 34.63	1.120	22 41 24.8	0.45	3 11.0	4	6 12 8.22	1.357	22 43 38.9	0.13	1 24.6
5	5 57 1.64	1.131	22 41 35.3	0.43	3 7.5	5	6 12 40.84	1.362	22 43 35.6	0.15	1 21.2
6	5 57 28.90	+1.141	+22 41 45.6	+0.42	3 4.0	6	6 13 13.57	+1.366	+22 43 31.8	-0.17	1 17.8
7	5 57 56.42	1.152	22 41 55.5	0.40	3 0.5	7	6 13 46.40	1.370	22 43 27.5	0.19	1 14.4
8	5 58 24.18	1.162	22 42 5.0	0.39	2 57.0	8	6 14 19.33	1.374	22 43 22.7	0.21	1 11.0
9	5 58 52.18	1.172	22 42 14.1	0.37	2 53.6	9	6 14 52.36	1.378	22 43 17.3	0.24	1 7.6
10	5 59 20.42	1.181	22 42 22.9	0.36	2 50.1	10	6 15 25.47	1.381	22 43 11.4	0.26	1 4.2
11	5 59 48.89	+1.191	+22 42 31.3	+0.34	2 46.7	11	6 15 58.66	+1.385	+22 43 4.9	-0.28	1 0.9
12	6 0 17.58	1.200	22 42 39.2	0.32	2 43.2	12	6 16 31.93	1.388	22 42 57.9	0.30	0 57.5
13	6 0 46.50	1.209	22 42 46.8	0.31	2 39.7	13	6 17 5.28	1.391	22 42 50.4	0.33	0 54.1
14	6 1 15.63	1.218	22 42 54.0	0.29	2 36.3	14	6 17 38.69	1.394	22 42 42.3	0.35	0 50.7
15	6 1 44.97	1.227	22 43 0.7	0.27	2 32.9	15	6 18 12.16	1.396	22 42 33.7	0.37	0 47.3
16	6 2 14.52	+1.235	+22 43 7.1	+0.25	2 29.4	16	6 18 45.69	+1.398	+22 42 24.6	-0.39	0 44.0
17	6 2 44.27	1.244	22 43 12.9	0.24	2 26.0	17	6 19 19.28	1.400	22 42 14.9	0.41	0 40.6
18	6 3 14.21	1.252	22 43 18.4	0.22	2 22.5	18	6 19 52.91	1.402	22 42 4.7	0.44	0 37.2
19	6 3 44.34	1.259	22 43 23.4	0.20	2 19.1	19	6 20 26.59	1.404	22 41 54.0	0.46	0 33.8
20	6 4 14.66	1.267	22 43 28.0	0.18	2 15.7	20	6 21 0.30	1.405	22 41 42.7	0.48	0 30.5
21	6 4 45.16	+1.274	+22 43 32.0	+0.16	2 12.3	21	6 21 34.04	+1.407	+22 41 31.0	-0.50	0 27.1
22	6 5 15.83	1.281	22 43 35.7	0.14	2 8.8	22	6 22 7.82	1.408	22 41 18.6	0.52	0 23.7
23	6 5 46.67	1.288	22 43 38.8	0.12	2 5.4	23	6 22 41.61	1.409	22 41 5.8	0.55	0 20.4
24	6 6 17.67	1.295	22 43 41.5	0.10	2 2.0	24	6 23 15.43	1.409	22 40 52.5	0.57	0 17.0
25	6 6 48.83	1.302	22 43 43.7	0.08	1 58.6	25	6 23 49.26	1.410	22 40 38.6	0.59	0 13.6
26	6 7 20.15	+1.308	+22 43 45.5	+0.06	1 55.2	26	6 24 23.10	+1.410	+22 40 24.2	-0.51	0 10.2
27	6 7 51.61	1.314	22 43 46.7	0.04	1 51.8	27	6 24 56.95	1.411	22 40 9.3	0.63	0 6.9
28	6 8 23.22	1.320	22 43 47.5	+0.02	1 48.3	28	6 25 30.80	1.411	22 39 53.9	0.65	0 3.5
29	6 8 54.97	1.326	22 43 47.8	0.00	1 44.9	29	6 26 4.65	1.410	22 39 38.0	0.67	0 0.1
30	6 9 26.86	1.331	22 43 47.6	-0.02	1 41.5	30	6 26 38.50	1.410	22 39 21.5	0.70	23 56.8
31	6 9 58.88	+1.337	+22 43 46.8	-0.04	1 38.1	31	6 27 12.34	+1.410	+22 39 4.6	-0.72	23 50.0
32	6 10 31.03	+1.342	+22 43 45.6	-0.06	1 34.7	32	6 27 46.16	+1.409	+22 38 47.1	-0.74	23 46.6
Day of the Month.						Day of the Month.					
1st.						2d.					
9th.						10th.					
17th.						18th.					
25th.						26th.					
Semidiameter . . .						Semidiameter . . .					
Horizontal Parallax						Horizontal Parallax					
8.03						7.79					
0.91						0.88					
7.95						7.75					
0.90						0.88					
7.89						7.73					
0.90						0.88					
7.83						7.72					
0.89						0.88					

NOTE.—The sign + indicates north declinations.

## GREENWICH MEAN TIME.

GREENWICH MEAN TIME.

SEPTEMBER.						OCTOBER.					
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Merid- ian Pas- sage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	M iles
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.	
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h
1	6 58 39.79	+1.005	+22 10 16.0	-1.32	20 17.4	1	7 8 7.98	+0.548	+21 56 54.4	-0.82	18
2	6 59 3.75	0.992	22 9 44.6	1.31	20 13.9	2	7 8 20.93	0.530	21 56 35.2	0.79	18
3	6 59 27.40	0.979	22 9 13.3	1.30	20 10.3	3	7 8 33.44	0.512	21 56 16.5	0.76	18
4	6 59 50.75	0.966	22 8 42.2	1.29	20 6.8	4	7 8 45.52	0.494	21 55 58.5	0.74	18
5	7 0 13.78	0.953	22 8 11.3	1.28	20 3.2	5	7 8 57.17	0.476	21 55 41.2	0.71	18
6	7 0 36.50	+0.940	+22 7 40.6	-1.27	19 59.6	6	7 9 8.38	+0.458	+21 55 24.5	-0.68	18
7	7 0 58.89	0.926	22 7 10.1	1.26	19 56.1	7	7 9 19.14	0.439	21 55 8.6	0.65	18
8	7 1 20.95	0.912	22 6 40.0	1.25	19 52.5	8	7 9 29.45	0.420	21 54 53.3	0.62	18
9	7 1 42.68	0.898	22 6 10.1	1.24	19 48.9	9	7 9 39.32	0.402	21 54 38.8	0.59	17
10	7 2 4.07	0.884	22 5 40.5	1.23	19 45.4	10	7 9 48.73	0.383	21 54 25.0	0.56	17
11	7 2 25.12	+0.870	+22 5 11.2	-1.21	19 41.8	11	7 9 57.68	+0.364	+21 54 11.9	-0.53	17
12	7 2 45.82	0.855	22 4 42.2	1.20	19 38.2	12	7 10 6.18	0.345	21 53 59.6	0.50	17
13	7 3 6.17	0.840	22 4 13.6	1.19	19 34.6	13	7 10 14.22	0.325	21 53 48.0	0.47	17
14	7 3 26.17	0.826	22 3 45.3	1.17	19 31.0	14	7 10 21.80	0.306	21 53 37.2	0.43	17
15	7 3 45.80	0.811	22 3 17.4	1.15	19 27.4	15	7 10 28.91	0.287	21 53 27.2	0.40	17
16	7 4 5.07	+0.795	+22 2 50.0	-1.14	19 23.7	16	7 10 35.55	+0.267	+21 53 18.0	-0.37	17
17	7 4 23.98	0.780	22 2 22.9	1.12	19 20.1	17	7 10 41.73	0.248	21 53 9.5	0.34	17
18	7 4 42.51	0.764	22 1 56.2	1.10	19 16.5	18	7 10 47.44	0.228	21 53 1.9	0.30	17
19	7 5 0.67	0.749	22 1 30.0	1.08	19 12.9	19	7 10 52.68	0.209	21 52 55.0	0.27	17
20	7 5 18.44	0.733	22 1 4.2	1.06	19 9.2	20	7 10 57.45	0.189	21 52 49.0	0.23	17
21	7 5 35.84	+0.717	+22 0 38.9	-1.04	19 5.6	21	7 11 1.75	+0.169	+21 52 43.7	-0.20	17
22	7 5 52.85	0.701	22 0 14.1	1.02	19 1.9	22	7 11 5.58	0.150	21 52 39.3	0.17	17
23	7 6 9.47	0.684	21 59 49.8	1.00	18 58.2	23	7 11 8.93	0.130	21 52 35.7	0.13	17
24	7 6 25.70	0.668	21 59 26.0	0.98	18 54.6	24	7 11 11.80	0.110	21 52 33.0	0.10	17
25	7 6 41.54	0.651	21 59 2.6	0.96	18 50.9	25	7 11 14.20	0.090	21 52 31.0	0.06	16
26	7 6 56.97	+0.635	+21 58 39.8	-0.94	18 47.2	26	7 11 16.12	+0.070	+21 52 29.9	-0.03	16
27	7 7 12.00	0.618	21 58 17.6	0.91	18 43.5	27	7 11 17.56	0.050	21 52 29.7	+0.01	16
28	7 7 26.62	0.601	21 57 55.9	0.89	18 39.8	28	7 11 18.52	0.030	21 52 30.3	0.04	16
29	7 7 40.82	0.583	21 57 34.8	0.87	18 36.1	29	7 11 18.99	+0.010	21 52 31.7	0.08	16
30	7 7 54.61	0.566	21 57 14.3	0.84	18 32.4	30	7 11 18.99	-0.010	21 52 34.0	0.11	16
31	7 8 7.98	+0.548	+21 56 54.4	-0.82	18 28.7	31	7 11 18.50	-0.030	+21 52 37.2	+0.15	16
32	7 8 20.93	+0.530	+21 56 35.2	-0.79	18 25.0	32	7 11 17.53	-0.050	+21 52 41.2	+0.18	16
Day of the Month.						Day of the Month.					
Semidiameter . . .						Semidiameter . . . . .					
Horizontal Parallax						Horizontal Parallax . . .					
6th.						8th.					
14th.						10th.					
22d.											
30th.											
8.16						8.61					
0.93						0.98					
8.26						8.74					
0.94						0.99					
8.37											
0.95											
8.49											
0.96											

NOTE.—The sign + indicates north declinations.

GREENWICH MEAN TIME.

NOVEMBER.						DECEMBER.					
Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Meridian Passage.	Day of Month.	Apparent Right Ascension.	Var. of R. A. for 1 Hour.	Apparent Declination.	Var. of Decl. for 1 Hour.	Meridian Passage.
	Noon.	Noon.	Noon.	Noon.			Noon.	Noon.	Noon.	Noon.	
	h m s	s	° ' "	"	h m		h m s	s	° ' "	"	h m
1	7 11 17.53	−0.090	+21 52 41.2	+0.18	16 29.8	1	7 7 13.66	−0.603	+22 0 58.2	+1.14	14 27.7
2	7 11 16.08	0.071	21 52 46.0	0.22	16 25.8	2	7 6 59.01	0.618	22 1 25.8	1.16	14 23.5
3	7 11 14.15	0.091	21 52 51.8	0.26	16 21.9	3	7 6 43.99	0.633	22 1 53.9	1.18	14 19.3
4	7 11 11.73	0.111	21 52 58.3	0.29	16 17.9	4	7 6 28.62	0.648	22 2 22.6	1.21	14 15.1
5	7 11 8.83	0.131	21 53 5.8	0.33	16 13.9	5	7 6 12.90	0.662	22 2 51.8	1.23	14 10.9
6	7 11 5.45	−0.151	+21 53 14.1	+0.36	16 9.9	6	7 5 56.84	−0.676	+22 3 21.5	+1.25	14 6.7
7	7 11 1.59	0.171	21 53 23.2	0.40	16 5.9	7	7 5 40.46	0.690	22 3 51.7	1.27	14 2.5
8	7 10 57.25	0.191	21 53 33.2	0.43	16 1.9	8	7 5 23.75	0.703	22 4 22.3	1.29	13 58.3
9	7 10 52.44	0.210	21 53 44.1	0.47	15 57.9	9	7 5 6.74	0.715	22 4 53.5	1.31	13 54.1
10	7 10 47.16	0.230	21 53 55.8	0.50	15 53.9	10	7 4 49.42	0.728	22 5 25.0	1.32	13 49.9
11	7 10 41.40	−0.249	+21 54 8.3	+0.54	15 49.8	11	7 4 31.82	−0.739	+22 5 56.9	+1.34	13 45.6
12	7 10 35.18	0.269	21 54 21.6	0.57	15 45.8	12	7 4 13.94	0.751	22 6 29.2	1.35	13 41.4
13	7 10 28.50	0.288	21 54 35.8	0.61	15 41.7	13	7 3 55.78	0.762	22 7 1.9	1.37	13 37.2
14	7 10 21.36	0.307	21 54 50.8	0.64	15 37.7	14	7 3 37.37	0.772	22 7 34.9	1.38	13 32.9
15	7 10 13.76	0.326	21 55 6.6	0.67	15 33.6	15	7 3 18.71	0.783	22 8 8.3	1.40	13 28.7
16	7 10 5.70	−0.345	+21 55 23.1	+0.71	15 29.6	16	7 2 59.81	−0.792	+22 8 41.9	+1.41	13 24.4
17	7 9 57.20	0.363	21 55 40.5	0.74	15 25.5	17	7 2 40.68	0.802	22 9 15.8	1.42	13 20.2
18	7 9 48.26	0.382	21 55 58.6	0.77	15 21.4	18	7 2 21.34	0.810	22 9 49.9	1.43	13 15.9
19	7 9 38.88	0.400	21 56 17.4	0.80	15 17.3	19	7 2 1.79	0.819	22 10 24.3	1.44	13 11.7
20	7 9 29.06	0.418	21 56 37.0	0.83	15 13.2	20	7 1 42.04	0.827	22 10 58.9	1.45	13 7.4
21	7 9 18.81	−0.436	+21 56 57.4	+0.86	15 9.1	21	7 1 22.11	−0.834	+22 11 33.7	+1.45	13 3.1
22	7 9 8.13	0.454	21 57 18.4	0.89	15 5.0	22	7 1 2.00	0.841	22 12 8.6	1.46	12 58.9
23	7 8 57.03	0.471	21 57 40.2	0.92	15 0.9	23	7 0 41.73	0.848	22 12 43.7	1.47	12 54.6
24	7 8 45.51	0.489	21 58 2.6	0.95	14 56.7	24	7 0 21.31	0.854	22 13 19.0	1.47	12 50.3
25	7 8 33.58	0.506	21 58 25.8	0.98	14 52.6	25	7 0 0.75	0.860	22 13 54.3	1.47	12 46.1
26	7 8 21.25	−0.522	+21 58 49.6	+1.01	14 48.5	26	6 59 40.05	−0.865	+22 14 29.8	+1.48	12 41.8
27	7 8 8.51	0.539	21 59 14.0	1.03	14 44.3	27	6 59 19.24	0.869	22 15 5.3	1.48	12 37.5
28	7 7 55.37	0.555	21 59 39.2	1.06	14 40.2	28	6 58 58.32	0.874	22 15 40.8	1.48	12 33.2
29	7 7 41.85	0.572	22 0 4.9	1.09	14 36.0	29	6 58 37.31	0.877	22 16 16.5	1.48	12 28.9
30	7 7 27.94	0.587	22 0 31.3	1.11	14 31.8	30	6 58 16.21	0.881	22 16 52.1	1.48	12 24.7
31	7 7 13.66	−0.603	+22 0 58.2	+1.14	14 27.7	31	6 57 55.05	−0.883	+22 17 27.7	+1.48	12 20.4
32	7 6 59.00	−0.618	+22 1 25.8	+1.16	14 23.5	32	6 57 33.82	−0.885	+22 18 3.3	+1.48	12 16.1
Day of the Month.						Day of Month.					
Semidiameter . . .						Semidiam.					
Horizontal Parallax						Hor. Par. .					
1st.						3d.					
9th.						11th.					
17th.						19th.					
25th.						27th.					
"						"					
"						"					
9.00						9.45					
9.12						9.53					
9.24						9.59					
9.35						9.62					
1.02						1.07					
1.04						1.08					
1.05						1.09					
1.06						1.09					
1.06						1.09					

NOTE.—The sign + prefixed to the hourly change of declination indicates that north declinations are increasing; the sign − indicates that north declinations are decreasing.

## GREENWICH MEAN TIME.

*Least semidiameter,*  
*Greatest semidiameter,*

February 1, 1".61  
 August 6, 1".77

Least horizontal parallax, February 1, 0".42  
 Greatest horizontal parallax, August 6, 0".47

[Eph 15]

## MEAN TIME.

Greatest semidiameter.  
 Least semidiameter,  
 1915—1915—12

January 19. 1".13  
 July 23. 1".25

[Eph 15]

Greatest horizontal parallax, January 19. 6".30  
 Least horizontal parallax, July 23. 6".28



MERCURY.

GREENWICH MEAN NOON.

MERCURY.

GREENWICH MEAN NOON.

MERCURY.

MEAN NOON.

MERCURY.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Distance from Earth—	
							At Date.	At Interme- diate Date.
	° ' "	° ' "	' "	° ' "	' "			
May 16	130 7 5.8	5 31 28.2	+ 3 11.6	+6 56 54.0	+ 5 2.2	9.519 5488	0.056 5636	0.052 7329
17	135 33 51.8	5 22 1.2	+ 0 47.3	6 59 59.6	+ 1 12.0	9.525 8777	0.048 8253	0.044 8440
18	140 51 4.4	5 12 23.0	- 1 34.4	6 59 24.2	- 2 19.4	9.532 4660	0.040 7923	0.036 6733
19	145 58 37.0	5 2 42.5	3 48.8	6 55 27.5	5 30.6	9.539 2373	0.032 4901	0.028 2458
20	150 56 31.0	4 53 7.1	5 52.2	6 48 29.8	8 21.3	9.546 1218	0.023 9433	0.019 5855
21	155 44 54.9	4 43 43.0	- 7 41.7	+6 38 51.5	-10 51.8	9.553 0570	0.015 1753	0.010 7154
22	160 24 2.4	4 34 35.1	9 15.5	6 26 52.5	13 3.0	9.559 9875	0.006 2086	0.001 6574
23	164 54 11.6	4 25 47.0	10 32.4	6 12 51.4	14 56.1	9.566 8653	9.997 0644	9.992 4321
24	169 15 43.8	4 17 21.4	11 32.2	5 57 5.7	16 32.5	9.573 6490	9.987 7630	9.983 0595
25	173 29 2.5	4 9 20.2	12 14.9	5 39 51.4	17 53.6	9.580 3033	9.978 3239	9.973 5586
26	177 34 32.5	4 1 44.3	-12 41.2	+5 21 23.0	-19 1.1	9.586 7988	9.968 7658	9.963 9477
27	181 32 39.6	3 54 34.2	12 51.9	5 1 53.3	19 56.4	9.593 1109	9.959 1066	9.954 2447
28	185 23 49.5	3 47 49.9	12 48.2	4 41 33.8	20 40.9	9.599 2193	9.949 3642	9.944 4672
29	189 8 28.0	3 41 31.4	12 31.2	4 20 34.7	21 16.0	9.605 1077	9.939 5560	9.934 6329
30	192 47 0.7	3 35 38.0	12 2.4	3 59 4.7	21 42.8	9.610 7630	9.929 7001	9.924 7597
31	196 19 52.1	3 30 8.8	-11 23.1	+3 37 11.5	-22 2.4	9.616 1748	9.919 8140	9.914 8654
June 1	199 47 26.2	3 25 3.2	10 34.6	3 15 2.0	22 15.8	9.621 3351	9.909 9162	9.904 9689
2	203 10 6.1	3 20 20.2	9 38.3	2 52 41.8	22 23.8	9.626 2380	9.900 0260	9.895 0900
3	206 28 13.8	3 15 58.8	8 35.4	2 30 15.9	22 27.2	9.630 8789	9.890 1637	9.885 2497
4	209 42 10.6	3 11 58.1	7 27.1	2 7 48.7	22 26.6	9.635 2548	9.880 3509	9.875 4702
5	212 52 16.6	3 8 17.2	- 6 14.6	+1 45 23.9	-22 22.6	9.639 3637	9.870 6108	9.865 7758
6	215 58 51.3	3 4 55.2	4 59.0	1 23 4.6	22 15.5	9.643 2043	9.860 9684	9.856 1922
7	219 2 13.1	3 1 51.3	3 41.2	1 0 53.7	22 5.9	9.646 7762	9.851 4509	9.846 7482
8	222 2 39.6	2 59 4.6	2 22.2	0 38 53.5	21 54.1	9.650 0794	9.842 0879	9.837 4741
9	225 0 27.7	2 56 34.4	- 1 2.7	+0 17 6.2	21 40.3	9.653 1140	9.832 9112	9.828 4035
10	227 55 53.6	2 54 20.0	+ 0 16.3	-0 4 26.5	-21 24.8	9.655 8809	9.823 9554	9.819 5718
11	230 49 12.7	2 52 20.8	1 34.2	0 25 42.9	21 7.8	9.658 3811	9.815 2578	9.811 0183
12	233 40 40.0	2 50 36.3	2 50.4	0 46 41.7	20 49.4	9.660 6155	9.806 8587	9.802 7843
13	236 30 29.9	2 49 5.9	4 4.1	1 7 21.5	20 29.8	9.662 5850	9.798 8008	9.794 9139
14	239 18 56.3	2 47 49.2	5 14.9	1 27 41.1	20 9.1	9.664 2906	9.791 1295	9.787 4537
15	242 6 12.7	2 46 45.8	+ 6 22.1	-1 47 39.4	-19 47.3	9.665 7332	9.783 8926	9.780 4525
16	244 52 32.2	2 45 55.4	7 25.4	2 7 15.3	19 24.4	9.666 9138	9.777 1397	9.773 9607
17	247 38 7.7	2 45 17.8	8 24.2	2 26 27.9	19 0.5	9.667 8330	9.770 9218	9.768 0294
18	250 23 11.9	2 44 52.7	9 18.1	2 45 16.0	18 35.5	9.668 4914	9.765 2899	9.762 7096
19	253 7 57.2	2 44 39.9	10 6.7	3 3 38.6	18 9.4	9.668 8895	9.760 2948	9.758 0515
20	255 52 35.8	2 44 39.4	+10 49.7	-3 21 34.6	-17 42.3	9.669 0275	9.755 9859	9.754 1037
21	258 37 20.0	2 44 51.1	11 26.7	3 39 2.9	17 14.1	9.668 9057	9.752 4103	9.750 9110
22	261 22 22.0	2 45 15.0	11 57.5	3 56 2.3	16 44.5	9.668 5238	9.749 6106	9.748 5136
23	264 7 54.1	2 45 51.2	12 21.7	4 12 31.4	16 13.5	9.667 8815	9.747 6243	9.746 9464
24	266 54 8.5	2 46 39.7	12 39.0	4 28 28.8	15 41.1	9.666 9785	9.746 4831	9.746 2373
25	269 41 17.6	2 47 40.7	+12 49.3	-4 43 53.0	-15 7.0	9.665 8142	9.746 2111	9.746 4062
26	272 29 34.1	2 48 54.5	12 52.3	4 58 42.3	14 31.2	9.664 3878	9.746 8238	9.747 4644
27	275 19 10.8	2 50 21.1	12 47.8	5 12 54.7	13 53.4	9.662 6986	9.748 3279	9.749 4138
28	278 10 20.7	2 52 1.0	12 35.7	5 26 28.2	13 13.4	9.660 7455	9.750 7208	9.752 2471
29	281 3 17.3	2 53 54.6	12 15.9	5 39 20.6	12 31.0	9.658 5275	9.753 9905	9.755 9482
30	283 58 14.5	2 56 2.1	+11 48.4	-5 51 29.3	-11 46.0	9.656 0438	9.758 1167	9.760 4921
July 1	286 55 26.4	2 58 24.1	+11 13.0	-6 2 51.6	-10 58.1	9.653 2935	9.763 0703	9.765 8464

## MERCURY.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.		
	"	'	"
July	1	286 55	26.4
	2	289 55	7.7
	3	292 57	33.8
	4	296 3	0.3
	5	299 11	43.6
	6	302 24	0.9
	7	305 40	9.9
	8	309 0	29.0
	9	312 25	17.3
	10	315 54	54.6
	11	319 29	41.6
	12	323 9	59.5
	13	326 56	9.9
	14	330 48	35.0
	15	334 47	37.4
	16	338 53	39.6
	17	343 7	3.8
	18	347 28	11.7
	19	351 57	24.1
	20	356 34	59.8
	21	1 21	15.5
	22	6 16	24.8
	23	11 20	37.3
	24	16 33	57.4
	25	21 56	23.4
	26	27 27	46.5
	27	33 7	49.4
	28	38 56	5.4
	29	44 51	57.7
	30	50 54	38.9
	31	57 3	11.0
Aug.	1	63 16	26.0
	2	69 33	7.1
	3	75 51	50.1
	4	82 11	6.1
	5	88 29	24.1
	6	94 45	14.2
	7	100 57	10.1
	8	107 3	52.3
	9	113 4	9.8
	10	118 57	2.3
	11	124 41	40.8
	12	130 17	27.5
	13	135 43	56.2
	14	141 0	51.2
	15	146 8	6.0
	16	151 5	42.4

MERCURY.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Distance from Earth—	
							At Date.	At Interme- diate Date.
	° ' "	° ' "	' "	° ' "	' "			
Aug. 16	151 5 42.4	4 52 49.6	— 5 55.8	+6 48 14.3	— 8 26.3	9.546 3330	0.133 4221	0.133 8259
17	155 53 49.1	4 43 26.0	7 44.8	6 38 31.4	10 56.2	9.553 2689	0.134 1506	0.134 3987
18	160 32 39.9	4 34 18.7	9 18.1	6 26 28.3	13 6.9	9.560 1986	0.134 5728	0.134 6754
19	165 2 33.0	4 25 31.2	10 34.5	6 12 23.7	14 59.4	9.567 0742	0.134 7087	0.134 6751
20	169 23 49.7	4 17 6.3	11 33.8	5 56 35.1	16 35.2	9.573 8545	0.134 5766	0.134 4152
21	173 36 53.7	4 9 5.8	—12 16.0	+5 39 18.3	—17 55.9	9.580 5045	0.134 1929	0.133 9118
22	177 42 9.8	4 1 30.6	12 41.8	5 20 47.8	19 3.0	9.586 9949	0.133 5736	0.133 1799
23	181 40 3.6	3 54 21.4	12 52.0	5 1 16.4	19 58.0	9.593 3010	0.132 7323	0.132 2325
24	185 31 1.2	3 47 38.0	12 47.9	4 40 55.5	20 42.1	9.599 4029	0.131 6817	0.131 0814
25	189 15 28.2	3 41 20.2	12 30.5	4 19 55.3	21 16.8	9.605 2844	0.130 4329	0.129 7374
26	192 53 50.0	3 35 27.5	—12 1.3	+3 58 24.5	—21 43.4	9.610 9324	0.128 9960	0.128 2097
27	196 26 31.3	3 29 59.2	11 21.7	3 36 30.7	22 2.9	9.616 3366	0.127 3795	0.126 5064
28	199 53 56.1	3 24 54.3	10 32.9	3 14 20.8	22 16.1	9.621 4893	0.125 5911	0.124 6345
29	203 16 27.3	3 20 11.9	9 36.4	2 52 0.3	22 24.0	9.626 3843	0.123 6373	0.122 6002
30	206 34 27.0	3 15 51.1	8 33.3	2 29 34.3	22 27.3	9.631 0172	0.121 5236	0.120 4083
31	209 48 16.4	3 11 51.0	— 7 24.9	+2 7 7.1	—22 26.5	9.635 3850	0.119 2546	0.118 0631
Sept. 1	212 58 15.6	3 8 10.7	6 12.3	1 44 42.4	22 22.3	9.639 4856	0.116 8340	0.115 5678
2	216 4 44.1	3 4 49.3	4 56.6	1 22 23.4	22 15.2	9.643 3179	0.114 2647	0.112 9250
3	219 8 0.2	3 1 45.9	3 38.8	1 0 12.8	22 5.6	9.646 8815	0.111 5489	0.110 1366
4	222 8 21.6	2 58 59.7	2 19.7	0 38 13.0	21 53.7	9.650 1764	0.108 6882	0.107 2039
5	225 6 5.1	2 56 30.0	— 1 0.3	+0 16 26.0	—21 39.9	9.653 2028	0.105 6836	0.104 1273
6	228 1 26.8	2 54 16.1	+ 0 18.7	—0 5 6.2	21 24.3	9.655 9617	0.102 5350	0.100 9067
7	230 54 42.3	2 52 17.4	1 36.6	0 26 22.1	21 7.2	9.658 4538	0.099 2422	0.097 5414
8	233 46 6.4	2 50 33.3	2 52.7	0 47 20.3	20 48.8	9.660 6799	0.095 8042	0.094 0304
9	236 35 53.5	2 49 3.3	4 6.4	1 7 59.4	20 29.2	9.662 6413	0.092 2197	0.090 3719
10	239 24 17.5	2 47 47.0	+ 5 17.0	—1 28 18.3	—20 8.5	9.664 3388	0.088 4867	0.086 5638
11	242 11 31.9	2 46 44.0	6 24.1	1 48 16.0	19 46.7	9.665 7733	0.084 6029	0.082 6036
12	244 57 49.9	2 45 54.1	7 27.2	2 7 51.3	19 23.7	9.666 9458	0.080 5656	0.078 4884
13	247 43 24.3	2 45 16.8	8 25.9	2 27 3.1	18 59.7	9.667 8570	0.076 3715	0.074 2146
14	250 28 27.7	2 44 52.0	9 19.6	2 45 50.4	18 34.7	9.668 5075	0.072 0171	0.069 7786
15	253 13 12.5	2 44 39.7	+10 8.1	—3 4 12.2	—18 8.7	9.668 8975	0.067 4985	0.065 1763
16	255 57 51.1	2 44 39.6	10 50.9	3 22 7.4	17 41.6	9.669 0275	0.062 8115	0.060 4034
17	258 42 35.7	2 44 51.6	11 27.8	3 39 34.9	17 13.2	9.668 8976	0.057 9515	0.055 4551
18	261 27 38.4	2 45 15.9	11 58.3	3 56 33.4	16 43.5	9.668 5075	0.052 9136	0.050 3264
19	264 13 11.6	2 45 52.5	12 22.3	4 13 1.5	16 12.5	9.667 8571	0.047 6928	0.045 0121
20	266 59 27.5	2 46 41.4	+12 39.4	—4 28 57.9	—15 40.0	9.666 9461	0.042 2837	0.039 5068
21	269 46 38.5	2 47 42.8	12 49.5	4 44 21.0	15 5.9	9.665 7736	0.036 6808	0.033 8049
22	272 34 57.3	2 48 57.0	12 52.2	4 59 9.1	14 30.0	9.664 3389	0.030 8784	0.027 9006
23	275 24 36.7	2 50 24.0	12 47.5	5 13 20.4	13 52.2	9.662 6415	0.024 8708	0.021 7883
24	278 15 49.7	2 52 4.3	12 35.2	5 26 52.7	13 12.1	9.660 6803	0.018 6524	0.015 4625
25	281 8 49.8	2 53 58.3	+12 15.2	—5 39 43.8	—12 29.6	9.658 4542	0.012 2178	0.008 9177
26	284 3 50.9	2 56 6.3	11 47.3	5 51 51.1	11 44.5	9.655 9622	0.005 5617	0.002 1491
27	287 1 7.3	2 58 28.8	11 11.8	6 3 11.9	10 56.6	9.653 2034	9.998 6794	9.995 1522
28	290 0 53.5	3 1 6.2	10 28.4	6 13 43.2	10 5.4	9.650 1770	9.991 5671	9.987 9236
29	293 3 24.9	3 3 59.2	9 37.4	6 23 21.5	9 10.6	9.646 8822	9.984 2217	9.980 4613
30	296 8 57.3	3 7 8.2	+ 8 39.0	—6 32 3.1	— 8 11.9	9.643 3186	9.976 6423	9.972 7647
Oct. 1	299 17 47.0	3 10 34.0	+ 7 33.4	—6 39 44.0	— 7 9.0	9.639 4862	9.968 8289	9.964 8354

## MERCURY.

GREENWICH MEAN NOON.

28

MERCURY.

GREENWICH MEAN NOON.



VENUS.

GREENWICH MEAN NOON.

Date.		Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of	
								Earth	
		° ' "	° ' "	' "	° ' "	' "		At Date.	
Jan.	0	119 14 43.4	1 37 24.9	+3 0.7	+2 19 49.2	+4 11.7	9.856 4263	9.600 1254	
	2	122 29 35.2	1 37 26.8	3 0.7	2 27 58.9	3 57.9	9.856 3991	9.614 3728	
	4	125 44 30.6	1 37 28.4	2 58.4	2 35 40.2	3 43.3	9.856 3812	9.628 4648	
	6	128 59 29.0	1 37 29.8	2 53.8	2 42 51.5	3 27.9	9.856 3728	9.642 3679	
	8	132 14 29.8	1 37 30.9	2 47.0	2 49 31.5	3 11.8	9.856 3738	9.656 0556	
	10	135 29 32.5	1 37 31.7	+2 38.0	+2 55 38.8	+2 55.2	9.856 3842	9.669 5082	
	12	138 44 36.3	1 37 32.1	2 27.0	3 1 12.2	2 38.0	9.856 4041	9.682 7116	
	14	141 59 40.7	1 37 32.2	2 14.1	3 6 10.6	2 20.3	9.856 4333	9.695 6565	
	16	145 14 45.0	1 37 32.0	1 59.5	3 10 33.1	2 2.1	9.856 4717	9.708 3384	
	18	148 29 48.5	1 37 31.4	1 43.3	3 14 18.8	1 43.5	9.856 5193	9.720 7565	
	20	151 44 50.6	1 37 30.5	+1 25.8	+3 17 27.0	+1 24.6	9.856 5758	9.732 9125	
	22	154 59 50.4	1 37 29.2	1 7.4	3 19 57.1	1 5.4	9.856 6410	9.744 8091	
	24	158 14 47.4	1 37 27.6	0 47.8	3 21 48.7	0 46.1	9.856 7148	9.756 4493	
	26	161 29 40.8	1 37 25.6	0 27.8	3 23 1.5	0 26.6	9.856 7970	9.767 8372	
	28	164 44 29.9	1 37 23.3	+0 7.4	3 23 35.2	+0 7.1	9.856 8871	9.778 9772	
	30	167 59 14.0	1 37 20.7	-0 13.1	+3 23 29.8	-0 12.5	9.856 9849	9.789 8735	
Feb.	1	171 13 52.6	1 37 17.7	0 33.4	3 22 45.3	0 32.0	9.857 0902	9.800 5306	
	3	174 28 24.8	1 37 14.4	0 53.2	3 21 22.0	0 51.3	9.857 2025	9.810 9526	
	5	177 42 50.1	1 37 10.8	1 12.4	3 19 20.2	1 10.4	9.857 3215	9.821 1434	
	7	180 57 7.9	1 37 6.9	1 30.6	3 16 40.3	1 29.3	9.857 4469	9.831 1070	
	9	184 11 17.7	1 37 2.8	-1 47.7	+3 13 23.0	-1 47.9	9.857 5782	9.840 8482	
	11	187 25 18.9	1 36 58.4	2 3.4	3 9 28.9	2 6.1	9.857 7149	9.850 3725	
	13	190 39 11.1	1 36 53.7	2 17.5	3 4 58.8	2 23.8	9.857 8566	9.859 6859	
	15	193 52 53.8	1 36 48.9	2 29.9	2 59 53.8	2 41.1	9.858 0030	9.868 7949	
	17	197 6 26.7	1 36 43.9	2 40.3	2 54 14.8	2 57.8	9.858 1534	9.877 7064	
	19	200 19 49.4	1 36 38.8	-2 48.7	+2 48 3.0	-3 13.9	9.858 3074	9.886 4273	
	21	203 33 1.7	1 36 33.5	2 55.0	2 41 19.7	3 29.3	9.858 4645	9.894 9641	
	23	206 46 3.3	1 36 28.1	2 59.1	2 34 6.2	3 44.0	9.858 6243	9.903 3227	
	25	209 58 54.1	1 36 22.7	3 0.9	2 26 23.9	3 58.1	9.858 7862	9.911 5087	
	27	213 11 33.9	1 36 17.2	3 0.5	2 18 14.4	4 11.3	9.858 9496	9.919 5273	
	Mar.	1	216 24 2.7	1 36 11.7	-2 57.8	+2 9 39.3	-4 23.7	9.859 1142	9.927 3833
		3	219 36 20.5	1 36 6.2	2 52.8	2 0 40.3	4 35.2	9.859 2793	9.935 0806
5		222 48 27.4	1 36 0.7	2 45.7	1 51 19.1	4 45.9	9.859 4444	9.942 6224	
7		226 0 23.5	1 35 55.4	2 36.6	1 41 37.5	4 55.6	9.859 6091	9.950 0116	
9		229 12 9.0	1 35 50.1	2 25.5	1 31 37.3	5 4.4	9.859 7727	9.957 2513	
11		232 23 44.0	1 35 44.9	-2 12.6	+1 21 20.5	-5 12.2	9.859 9349	9.964 3445	
13		235 35 8.8	1 35 39.9	1 58.0	1 10 49.2	5 19.0	9.860 0950	9.971 2949	
15		238 46 23.7	1 35 35.1	1 42.0	1 0 5.1	5 24.9	9.860 2527	9.978 1066	
17		241 57 29.2	1 35 30.4	1 24.8	0 49 10.3	5 29.7	9.860 4074	9.984 7835	
19		245 8 25.5	1 35 25.9	1 6.6	0 38 6.9	5 33.5	9.860 5586	9.991 3300	
21		248 19 13.1	1 35 21.7	-0 47.5	+0 26 56.9	-5 36.3	9.860 7059	9.997 7498	
23		251 29 52.5	1 35 17.7	0 27.8	0 15 42.3	5 38.1	9.860 8489	0.004 0469	
25		254 40 24.1	1 35 14.0	-0 7.8	+0 4 25.3	5 38.8	9.860 9870	0.010 2252	
27		257 50 48.6	1 35 10.5	+0 12.2	-0 6 52.1	5 38.5	9.861 1199	0.016 2879	
29		261 1 6.3	1 35 7.3	0 32.1	0 18 7.8	5 37.1	9.861 2472	0.022 2377	
31		264 11 17.9	1 35 4.4	+0 51.6	-0 29 19.8	-5 34.7	9.861 3685	0.028 0773	
Apr.	2	267 21 23.8	1 35 1.7	+1 10.4	-0 40 26.1	-5 31.4	9.861 4835	0.033 8087	

## VENUS.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.			Daily Motion.		
	°	'	"	°	'	"
Apr. 2	267	21	23.8	1	35	1.7
4	270	31	24.8	1	34	59.4
6	273	41	21.4	1	34	57.4
8	276	51	14.2	1	34	53.6
10	280	1	3.7	1	34	54.1
12	283	10	50.5	1	34	52.9
14	286	20	35.2	1	34	52.0
16	289	30	18.4	1	34	51.4
18	292	40	0.6	1	34	51.0
20	295	49	42.4	1	34	50.9
22	298	59	24.2	1	34	51.0
24	302	9	6.5	1	34	51.4
26	305	18	49.8	1	34	52.0
28	308	28	34.6	1	34	52.9
30	311	38	21.3	1	34	53.9
May 2	314	48	10.3	1	34	55.1
4	317	58	1.8	1	34	56.5
6	321	7	56.4	1	34	58.1
8	324	17	54.3	1	34	59.8
10	327	27	55.8	1	35	1.7
12	330	38	1.2	1	35	3.7
14	333	48	10.7	1	35	5.8
16	336	58	24.6	1	35	8.1
18	340	8	43.0	1	35	20.4
20	343	19	6.2	1	35	22.8
22	346	29	34.3	1	35	25.3
24	349	40	7.4	1	35	27.9
26	352	50	45.7	1	35	30.5
28	356	1	29.4	1	35	33.2
30	359	12	18.5	1	35	35.9
June 1	2	23	13.1	1	35	38.7
3	5	34	13.3	1	35	32.5
5	8	45	19.2	1	35	34.4
7	11	56	30.9	1	35	37.3
9	15	7	48.5	1	35	40.3
11	18	19	12.0	1	35	43.3
13	21	30	41.6	1	35	46.3
15	24	42	17.3	1	35	49.4
17	27	53	59.1	1	35	52.5
19	31	5	47.2	1	35	55.6
21	34	17	41.7	1	35	58.8
23	37	29	42.7	1	36	1.1
25	40	41	50.2	1	36	5.4
27	43	54	4.2	1	36	8.7
29	47	6	24.9	1	36	12.1
July 1	50	18	52.5	1	36	15.5
3	53	31	26.9	1	36	18.9

VENUS.

GREENWICH MEAN NOON.

Date.		Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Ear
								At Date.
		° ' "	° ' "	' "	° ' "	' "		
July	1	50 18 52.5	1 36 15.5	-2 21.2	-1 28 5.0	+5 8.7	9.858 8046	0.201 8677
	3	53 31 26.9	1 36 18.9	2 7.6	1 17 39.4	5 16.7	9.858 6430	0.203 9214
	5	56 44 8.2	1 36 22.4	1 52.4	1 6 58.8	5 23.7	9.858 4834	0.205 9093
	7	59 56 56.6	1 36 25.9	1 35.8	0 56 5.1	5 29.8	9.858 3263	0.207 8312
	9	63 9 52.1	1 36 29.5	1 18.0	0 45 0.4	5 34.8	9.858 1724	0.209 6868
	11	66 22 54.7	1 36 33.1	-0 59.2	-0 33 46.7	+5 38.7	9.858 0220	0.211 4764
	13	69 36 4.5	1 36 36.7	0 39.6	0 22 26.1	5 41.6	9.857 8756	0.213 2005
	15	72 49 21.4	1 36 40.3	-0 19.5	-0 11 0.8	5 43.5	9.857 7337	0.214 8596
	17	76 2 45.6	1 36 43.9	+0 0.8	+0 0 27.1	5 44.2	9.857 5968	0.216 4542
	19	79 16 17.0	1 36 47.5	0 21.1	0 11 55.2	5 43.8	9.857 4653	0.217 9852
	21	82 29 55.5	1 36 51.1	+0 41.2	+0 23 21.5	+5 42.3	9.857 3396	0.219 4534
	23	85 43 41.1	1 36 54.6	1 0.8	0 34 43.8	5 39.7	9.857 2201	0.220 8599
	25	88 57 33.7	1 36 58.0	1 19.6	0 45 59.8	5 36.0	9.857 1073	0.222 2054
	27	92 11 33.2	1 37 1.4	1 37.4	0 57 7.3	5 31.3	9.857 0015	0.223 4905
	29	95 25 39.4	1 37 4.7	1 54.0	1 8 4.2	5 25.5	9.856 9030	0.224 7154
Aug.	31	98 39 52.1	1 37 8.0	+2 9.2	+1 18 48.4	+5 18.6	9.856 8122	0.225 8799
	2	101 54 11.2	1 37 11.1	2 22.7	1 29 17.8	5 10.6	9.856 7293	0.226 9837
	4	105 8 36.3	1 37 14.0	2 34.3	1 39 30.3	5 1.6	9.856 6547	0.228 0268
	6	108 23 7.1	1 37 16.8	2 44.0	1 49 23.9	4 51.7	9.856 5886	0.229 0093
	8	111 37 43.4	1 37 19.4	2 51.6	1 58 56.6	4 40.8	9.856 5312	0.229 9311
	10	114 52 24.7	1 37 21.8	+2 57.0	+2 8 6.6	4 29.0	9.856 4827	0.230 7922
	12	118 7 10.7	1 37 24.0	3 0.2	2 16 52.1	4 16.3	9.856 4432	0.231 5932
	14	121 22 0.8	1 37 26.0	3 1.0	2 25 11.4	4 2.8	9.856 4130	0.232 3345
	16	124 36 54.7	1 37 27.7	2 59.5	2 33 2.7	3 48.5	9.856 3921	0.233 0167
	18	127 51 51.7	1 37 29.2	2 55.7	2 40 24.6	3 33.4	9.856 3805	0.233 6409
	20	131 6 51.4	1 37 30.4	+2 49.6	+2 47 15.7	+3 17.6	9.856 3783	0.234 2081
	22	134 21 53.1	1 37 31.3	2 41.4	2 53 34.5	3 1.1	9.856 3855	0.234 7193
	24	137 36 56.3	1 37 31.8	2 31.1	2 59 19.8	2 44.1	9.856 4021	0.235 1754
	26	140 52 0.3	1 37 32.0	2 18.8	3 4 30.5	2 26.6	9.856 4281	0.235 5769
	28	144 7 4.4	1 37 31.9	2 4.8	3 9 5.6	2 8.6	9.856 4633	0.235 9239
Sept.	30	147 22 7.9	1 37 31.5	+1 49.1	+3 13 4.2	+1 50.1	9.856 5077	0.236 2167
	1	150 37 10.2	1 37 30.7	1 32.1	3 16 25.6	1 31.3	9.856 5610	0.236 4551
	3	153 52 10.6	1 37 29.6	1 13.9	3 19 9.1	1 12.2	9.856 6232	0.236 6392
	5	157 7 8.4	1 37 28.1	0 54.7	3 21 14.2	0 52.9	9.856 6939	0.236 7691
	7	160 22 2.8	1 37 26.2	0 34.8	3 22 40.5	0 33.4	9.856 7731	0.236 8448
	9	163 36 53.2	1 37 24.0	+0 14.5	+3 23 27.8	+0 13.9	9.856 8603	0.236 8663
	11	166 51 38.8	1 37 21.5	-0 5.9	3 23 36.1	-0 5.7	9.856 9554	0.236 8339
	13	170 6 19.1	1 37 18.7	0 26.3	3 23 5.3	0 25.2	9.857 0580	0.236 7482
	15	173 20 53.3	1 37 15.5	0 46.4	3 21 55.5	0 44.6	9.857 1677	0.236 6101
	17	176 35 20.9	1 37 12.0	1 5.8	3 20 7.1	1 3.8	9.857 2843	0.236 4205
	19	179 49 41.2	1 37 8.2	-1 24.4	+3 17 40.4	-1 22.8	9.857 4074	0.236 1804
	21	183 3 53.6	1 37 4.1	1 41.9	3 14 36.1	1 41.5	9.857 5365	0.235 8911
	23	186 17 57.6	1 36 59.8	1 58.1	3 10 54.7	1 59.8	9.857 6712	0.235 5529
	25	189 31 52.8	1 36 55.3	2 12.8	3 6 37.1	2 17.7	9.857 8110	0.235 1664
	27	192 45 38.7	1 36 50.5	2 25.8	3 1 44.2	2 35.1	9.857 9556	0.234 7321
Oct.	29	195 59 14.9	1 36 45.6	-2 36.9	+2 56 17.0	-2 52.0	9.858 1045	0.234 2500
	1	199 12 41.0	1 36 40.5	-2 46.0	+2 50 16.5	-3 8.4	9.858 2572	0.233 7202

VENUS.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vector.	Logarithm of Distance from Earth—	
							At Date.	At Intermediate Date.
Oct. 1	199 12 41.0	1 36 40.5	-2 46.0	+2 50 16.5	-3 8.4	9.858 2572	0.233 7202	0.233 4373
3	202 25 56.7	1 36 35.2	2 53.1	2 43 44.0	3 24.0	9.858 4132	0.233 1423	0.232 8353
5	205 39 1.9	1 36 29.9	2 57.9	2 36 40.9	3 39.0	9.858 5719	0.232 5164	0.232 1854
7	208 51 56.3	1 36 24.5	3 0.5	2 29 8.5	3 53.2	9.858 7330	0.231 8424	0.231 4874
9	212 4 39.8	1 36 19.0	3 0.9	2 21 8.3	4 6.7	9.858 8958	0.231 1204	0.230 7413
11	215 17 12.4	1 36 13.5	-2 59.0	+2 12 42.0	-4 19.4	9.859 0599	0.230 3502	0.229 9471
13	218 29 33.9	1 36 8.0	2 54.8	2 3 51.2	4 31.3	9.859 2247	0.229 5322	0.229 1055
15	221 41 44.5	1 36 2.6	2 48.4	1 54 37.5	4 42.3	9.859 3898	0.228 6673	0.228 2176
17	224 53 44.3	1 35 57.2	2 40.0	1 45 2.8	4 52.3	9.859 5546	0.227 7565	0.227 2842
19	228 5 33.3	1 35 51.9	2 29.6	1 35 9.0	5 1.4	9.859 7186	0.226 8007	0.226 3060
21	231 17 11.8	1 35 46.7	-2 17.3	+1 24 57.8	-5 9.6	9.859 8812	0.225 8002	0.225 2834
23	234 28 40.0	1 35 41.6	2 3.3	1 14 31.3	5 16.8	9.860 0421	0.224 7557	0.224 2170
25	237 39 58.3	1 35 36.7	1 47.8	1 3 51.4	5 22.9	9.860 2006	0.223 6674	0.223 1070
27	240 51 6.9	1 35 32.0	1 31.0	0 53 0.1	5 28.1	9.860 3563	0.222 5357	0.221 9536
29	244 2 6.3	1 35 27.5	1 13.0	0 41 59.5	5 32.3	9.860 5088	0.221 3605	0.220 7564
31	247 12 56.8	1 35 23.1	-0 54.2	+0 30 51.6	-5 35.4	9.860 6575	0.220 1413	0.219 5152
Nov. 2	250 23 38.9	1 35 19.0	0 34.7	0 19 38.4	5 37.5	9.860 8020	0.218 8781	0.218 2298
4	253 34 13.0	1 35 15.2	-0 14.8	+0 8 22.0	5 38.6	9.860 9418	0.217 5702	0.216 8993
6	256 44 39.8	1 35 11.7	+0 5.2	-0 2 55.5	5 38.7	9.861 0766	0.216 2171	0.215 5235
8	259 54 59.7	1 35 8.4	0 25.1	0 14 12.0	5 37.7	9.861 2059	0.214 8184	0.214 1018
10	263 5 13.3	1 35 5.3	+0 44.8	-0 25 25.6	-5 35.7	9.861 3293	0.213 3738	0.212 6344
12	266 15 21.1	1 35 2.5	1 3.9	0 36 34.1	5 32.6	9.861 4465	0.211 8836	0.211 1215
14	269 25 23.6	1 35 0.1	1 22.2	0 47 35.5	5 28.6	9.861 5571	0.210 3482	0.209 5637
16	272 35 21.6	1 34 58.0	1 39.5	0 58 27.9	5 23.6	9.861 6608	0.208 7680	0.207 9613
18	275 45 15.5	1 34 56.1	1 55.6	1 9 9.3	5 17.6	9.861 7573	0.207 1436	0.206 3149
20	278 55 6.0	1 34 54.5	+2 10.3	-1 19 37.7	-5 10.7	9.861 8463	0.205 4752	0.204 6246
22	282 4 53.6	1 34 53.2	2 23.3	1 29 51.4	5 2.8	9.861 9275	0.203 7630	0.202 8905
24	285 14 38.9	1 34 52.2	2 34.6	1 39 48.5	4 54.0	9.862 0006	0.202 0071	0.201 1126
26	288 24 22.4	1 34 51.5	2 44.1	1 49 27.1	4 44.4	9.862 0655	0.200 2070	0.199 2903
28	291 34 4.7	1 34 51.0	2 51.5	1 58 45.6	4 33.9	9.862 1220	0.198 3624	0.197 4233
30	294 43 46.4	1 34 50.8	+2 56.8	-2 7 42.3	-4 22.6	9.862 1699	0.196 4728	0.195 5107
Dec. 2	297 53 28.0	1 34 50.9	3 0.0	2 16 15.6	4 10.5	9.862 2091	0.194 5370	0.193 5517
4	301 3 10.0	1 34 51.2	3 1.0	2 24 23.9	3 57.6	9.862 2394	0.192 5546	0.191 5454
6	304 12 52.8	1 34 51.7	2 59.8	2 32 5.8	3 44.1	9.862 2608	0.190 5241	0.189 4905
8	307 22 36.9	1 34 52.5	2 56.4	2 39 20.0	3 29.9	9.862 2732	0.188 4445	0.187 3861
10	310 32 22.8	1 34 53.5	+2 50.9	-2 46 5.1	-3 15.0	9.862 2765	0.186 3152	0.185 2318
12	313 42 10.8	1 34 54.7	2 43.3	2 52 19.8	2 59.6	9.862 2708	0.184 1360	0.183 0276
14	316 52 1.3	1 34 56.0	2 33.6	2 58 3.1	2 43.6	9.862 2561	0.181 9067	0.180 7732
16	320 1 54.7	1 34 57.5	2 22.1	3 3 13.9	2 27.1	9.862 2325	0.179 6273	0.178 4689
18	323 11 51.3	1 34 59.2	2 8.9	3 7 51.2	2 10.2	9.862 1999	0.177 2980	0.176 1145
20	326 21 51.4	1 35 1.0	+1 54.1	-3 11 54.3	-1 52.8	9.862 1584	0.174 9184	0.173 7096
22	329 31 55.3	1 35 3.0	1 37.9	3 15 22.3	1 35.1	9.862 1083	0.172 4881	0.171 2537
24	332 42 3.3	1 35 5.1	1 20.6	3 18 14.6	1 17.1	9.862 0497	0.170 0065	0.168 7463
26	335 52 15.6	1 35 7.3	1 2.2	3 20 30.7	0 58.9	9.861 9827	0.167 4731	0.166 1867
28	339 2 32.4	1 35 9.6	0 43.0	3 22 10.0	0 40.4	9.861 9075	0.164 8869	0.163 5735
30	342 12 53.9	1 35 11.9	+0 23.3	-3 23 12.3	-0 21.8	9.861 8244	0.162 2464	0.160 9055
32	345 23 20.2	1 35 14.4	+0 3.4	-3 23 37.3	-0 3.2	9.861 7336	0.159 5504	0.158 1810

MARS.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.			Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.			Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of L Earth	
	°	'	"			°	'	"			At Date.	
Jan.	0	275	47 9.4	35 1.44	+53.7	-1	21	3.2	-46.47	0.158 5328	0.384	3051
	2	276	57 18.8	35 7.98	53.5	1	22	35.1	45.49	0.157 8631	0.383	8023
	4	278	7 41.3	35 14.47	53.2	1	24	5.1	44.57	0.157 2011	0.383	2854
	6	279	18 16.7	35 20.90	52.8	1	25	33.3	43.63	0.156 5471	0.382	7547
	8	280	29 4.8	35 27.26	52.4	1	26	59.7	42.67	0.155 9014	0.382	2100
	10	281	40 5.6	35 33.56	+51.8	-1	28	24.0	-41.67	0.155 2643	0.381	6516
	12	282	51 19.0	35 39.78	51.2	1	29	46.3	40.64	0.154 6361	0.381	0794
	14	284	2 44.7	35 45.93	50.4	1	31	6.6	39.58	0.154 0174	0.380	4938
	16	285	14 22.6	35 52.00	49.6	1	32	24.7	38.50	0.153 4082	0.379	8944
	18	286	26 12.6	35 57.99	48.7	1	33	40.5	37.39	0.152 8091	0.379	2822
	20	287	38 14.5	36 3.89	+47.7	-1	34	54.2	-36.25	0.152 2203	0.378	6578
	22	288	50 28.1	36 9.70	46.6	1	36	5.5	35.08	0.151 6423	0.378	0220
Feb.	24	290	2 53.3	36 15.41	45.5	1	37	14.5	33.88	0.151 0752	0.377	3755
	26	291	15 29.7	36 21.03	44.2	1	38	21.0	32.66	0.150 5195	0.376	7194
	28	292	28 17.3	36 26.54	42.9	1	39	25.1	31.41	0.149 9754	0.376	0541
	30	293	41 15.8	36 31.95	+41.5	-1	40	26.7	-30.13	0.149 4433	0.375	3804
	1	294	54 25.1	36 37.25	40.0	1	41	25.7	28.83	0.148 9235	0.374	6985
	3	296	7 44.8	36 42.42	38.4	1	42	22.0	27.51	0.148 4163	0.374	0095
	5	297	21 14.7	36 47.48	36.7	1	43	15.7	26.16	0.147 9221	0.373	3131
	7	298	34 54.6	36 52.41	35.0	1	44	6.6	24.79	0.147 4410	0.372	6090
	9	299	48 44.2	36 57.21	+33.2	-1	44	54.8	-23.40	0.146 9736	0.371	8976
	11	301	2 43.3	37 1.87	31.4	1	45	40.2	21.99	0.146 5199	0.371	1780
	13	302	16 51.6	37 6.41	29.5	1	46	22.8	20.55	0.146 0803	0.370	4505
	15	303	31 8.9	37 10.80	27.5	1	47	2.4	19.09	0.145 6551	0.369	7155
Mar.	17	304	45 34.7	37 15.05	25.5	1	47	39.2	17.62	0.145 2445	0.368	9739
	19	306	0 9.0	37 19.15	+23.4	-1	48	12.9	-16.13	0.144 8488	0.368	2259
	21	307	14 51.2	37 23.10	21.3	1	48	43.7	14.62	0.144 4683	0.367	4719
	23	308	29 41.3	37 26.89	19.1	1	49	11.4	13.10	0.144 1032	0.366	7126
	25	309	44 38.7	37 30.53	16.9	1	49	36.0	11.56	0.143 7538	0.365	9488
	27	310	59 43.3	37 34.01	14.7	1	49	57.6	10.01	0.143 4202	0.365	1813
	1	312	14 54.6	37 37.32	+12.4	-1	50	16.1	-8.44	0.143 1028	0.364	4099
	3	313	30 12.5	37 40.46	10.1	1	50	31.4	6.87	0.142 8017	0.363	6351
	5	314	45 36.4	37 43.44	7.8	1	50	43.5	5.28	0.142 5171	0.362	8571
	7	316	1 6.1	37 46.24	5.5	1	50	52.5	3.68	0.142 2493	0.362	0758
	9	317	16 41.2	37 48.87	3.1	1	50	58.2	2.08	0.141 9982	0.361	2906
	11	318	32 21.5	37 51.32	+ 0.7	-1	51	0.7	- 0.47	0.141 7644	0.360	5008
Apr.	13	319	48 6.4	37 53.59	- 1.7	1	51	0.1	+ 1.15	0.141 5476	0.359	7060
	15	321	3 55.7	37 55.68	4.1	1	50	56.1	2.77	0.141 3482	0.358	9067
	17	322	19 49.0	37 57.58	6.4	1	50	49.0	4.40	0.141 1664	0.358	1029
	19	323	35 45.9	37 59.30	8.8	1	50	38.5	6.02	0.141 0022	0.357	2947
	21	324	51 46.1	38 0.83	-11.1	-1	50	24.9	+ 7.65	0.140 8558	0.356	4827
	23	326	7 49.1	38 2.17	13.4	1	50	7.9	9.27	0.140 7273	0.355	6668
	25	327	23 54.6	38 3.32	15.7	1	49	47.8	10.88	0.140 6166	0.354	8477
	27	328	40 2.2	38 4.28	18.0	1	49	24.4	12.49	0.140 5241	0.354	0257
	29	329	56 11.5	38 5.04	20.2	1	48	57.8	14.10	0.140 4495	0.353	2007
	31	331	12 22.2	38 5.62	-22.4	-1	48	28.0	+15.71	0.140 3931	0.352	3736
	2	332	28 33.9	38 6.00	-24.5	-1	47	54.9	+17.31	0.140 3549	0.351	5435

MARS.

GREENWICH MEAN NOON.

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							At Date.	At Interme- diate Date.
	° ' "	' "	"	° ' "	"			
Apr. 2	332 28 33.9	38 6.00	-24.5	-1 47 54.9	+17.31	0.140 3549	0.351 5435	0.351 1274
4	333 44 46.1	38 6.19	26.6	1 47 18.7	18.89	0.140 3348	0.350 7106	0.350 2926
6	335 0 58.5	38 6.18	28.7	1 46 39.3	20.47	0.140 3331	0.349 8734	0.349 4531
8	336 17 10.7	38 5.98	30.7	1 45 56.8	22.04	0.140 3495	0.349 0316	0.348 6088
10	337 33 22.3	38 5.59	32.6	1 45 11.2	23.59	0.140 3842	0.348 1845	0.347 7588
12	338 49 32.8	38 5.00	-34.4	-1 44 22.5	+25.13	0.140 4370	0.347 3316	0.346 9031
14	340 5 42.1	38 4.22	36.2	1 43 30.7	26.65	0.140 5080	0.346 4732	0.346 0416
16	341 21 49.5	38 3.25	37.9	1 42 35.9	28.15	0.140 5971	0.345 6084	0.345 1734
18	342 37 54.9	38 2.08	39.6	1 41 38.1	29.64	0.140 7042	0.344 7369	0.344 2991
20	343 53 57.7	38 0.73	41.2	1 40 37.3	31.11	0.140 8293	0.343 8598	0.343 4189
22	345 9 57.7	37 59.18	-42.7	-1 39 33.7	+32.55	0.140 9722	0.342 9766	0.342 5328
24	346 25 54.3	37 57.45	44.1	1 38 27.1	33.97	0.141 1329	0.342 0875	0.341 6408
26	347 41 47.3	37 55.53	45.4	1 37 17.8	35.38	0.141 3113	0.341 1925	0.340 7428
28	348 57 36.3	37 53.43	46.6	1 36 5.6	36.75	0.141 5072	0.340 2915	0.339 8386
30	350 13 20.9	37 51.15	47.8	1 34 50.8	38.11	0.141 7205	0.339 3840	0.338 9278
May 2	351 29 0.8	37 48.69	-48.8	-1 33 33.2	+39.44	0.141 9511	0.338 4699	0.338 0096
4	352 44 35.6	37 46.06	49.8	1 32 13.1	40.74	0.142 1988	0.337 5473	0.337 0829
6	354 0 4.9	37 43.25	50.6	1 30 50.3	42.01	0.142 4634	0.336 6162	0.336 1471
8	355 15 28.5	37 40.26	51.3	1 29 25.0	43.26	0.142 7448	0.335 6754	0.335 2009
10	356 30 45.9	37 37.13	51.9	1 27 57.3	44.47	0.143 0426	0.334 7237	0.334 2435
12	357 45 56.9	37 33.81	-52.5	-1 26 27.2	+45.65	0.143 3570	0.333 7604	0.333 2743
14	359 1 1.1	37 30.34	52.9	1 24 54.7	46.80	0.143 6874	0.332 7853	0.332 2932
16	0 15 58.1	37 26.71	53.3	1 23 20.0	47.93	0.144 0338	0.331 7980	0.331 2997
18	1 30 47.8	37 22.91	53.5	1 21 43.0	49.02	0.144 3959	0.330 7982	0.330 2935
20	2 45 29.7	37 18.96	53.7	1 20 3.9	50.08	0.144 7735	0.329 7856	0.329 2745
22	4 0 3.5	37 14.86	-53.7	-1 18 22.7	+51.11	0.145 1662	0.328 7602	0.328 2427
24	5 14 29.0	37 10.61	53.7	1 16 39.5	52.10	0.145 5739	0.327 7219	0.327 1977
26	6 28 45.9	37 6.22	53.5	1 14 54.3	53.06	0.145 9963	0.326 6703	0.326 1394
28	7 42 53.8	37 1.70	53.3	1 13 7.3	53.98	0.146 4332	0.325 6050	0.325 0672
30	8 56 52.6	36 57.04	52.9	1 11 18.4	54.87	0.146 8842	0.324 5257	0.323 9800
June 1	10 10 41.9	36 52.25	-52.5	-1 9 27.8	+55.72	0.147 3491	0.323 4301	0.322 8762
3	11 24 21.5	36 47.33	51.9	1 7 35.5	56.54	0.147 8276	0.322 3180	0.321 7551
5	12 37 51.2	36 42.29	51.3	1 5 41.6	57.32	0.148 3193	0.321 1876	0.320 6154
7	13 51 10.6	36 37.13	50.6	1 3 46.2	58.07	0.148 8241	0.320 0383	0.319 4560
9	15 4 19.6	36 31.85	49.8	1 1 49.3	58.78	0.149 3415	0.318 8685	0.318 2758
11	16 17 17.9	36 26.46	-48.9	-0 59 51.0	+59.46	0.149 8713	0.317 6778	0.317 0744
13	17 30 5.4	36 20.97	47.9	0 57 51.4	60.10	0.150 4131	0.316 4655	0.315 8511
15	18 42 41.7	36 15.37	46.8	0 55 50.6	60.71	0.150 9666	0.315 2311	0.314 6055
17	19 55 6.8	36 9.68	45.6	0 53 48.6	61.29	0.151 5316	0.313 9741	0.313 3369
19	21 7 20.3	36 3.89	44.4	0 51 45.4	61.83	0.152 1076	0.312 6940	0.312 0452
21	22 19 22.3	35 58.01	-43.1	-0 49 41.3	+62.33	0.152 6944	0.311 3907	0.310 7304
23	23 31 12.3	35 52.05	41.7	0 47 36.1	62.80	0.153 2915	0.310 0641	0.309 3919
25	24 42 50.4	35 46.01	40.2	0 45 30.1	63.23	0.153 8989	0.308 7133	0.308 0286
27	25 54 16.3	35 39.89	38.7	0 43 23.3	63.62	0.154 5159	0.307 3375	0.306 6400
29	27 5 29.9	35 33.69	37.1	0 41 15.6	63.98	0.155 1424	0.305 9358	0.305 2247
July 1	28 16 31.0	35 27.42	-35.5	-0 39 7.4	+64.31	0.155 7777	0.304 5065	0.303 7811
3	29 27 19.5	35 21.08	-33.8	-0 36 58.4	+64.60	0.156 4221	0.303 0484	0.302 3079



MARS.

GREENWICH MEAN NOON.

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							At Date.
	° ' "	' "	"	° ' "	"		
July 1	28 16 31.0	35 27.42	-35.5	-0 39 7.4	+64.31	0.155 7777	0.304 5061
3	29 27 19.5	35 21.08	33.8	0 36 58.4	64.60	0.156 4221	0.303 0481
5	30 37 55.3	35 14.68	32.0	0 34 48.9	64.86	0.157 0745	0.301 5591
7	31 48 18.2	35 8.23	30.2	0 32 39.0	65.08	0.157 7352	0.300 0381
9	32 58 28.2	35 1.73	28.4	0 30 28.7	65.28	0.158 4035	0.298 4851
11	34 8 25.1	34 55.18	-26.5	-0 28 17.9	+65.44	0.159 0792	0.296 8981
13	35 18 8.9	34 48.58	24.6	0 26 6.9	65.57	0.159 7619	0.295 2776
15	36 27 39.4	34 41.94	22.6	0 23 55.7	65.67	0.160 4512	0.293 6218
17	37 36 56.6	34 35.26	20.6	0 21 44.2	65.74	0.161 1469	0.291 9301
19	38 46 0.4	34 28.55	18.6	0 19 32.7	65.78	0.161 8485	0.290 2026
21	39 54 50.8	34 21.81	-16.6	-0 17 21.2	+65.79	0.162 5558	0.288 4388
23	41 3 27.7	34 15.04	14.6	0 15 9.6	65.76	0.163 2685	0.286 6381
25	42 11 51.0	34 8.25	12.5	0 12 58.1	65.71	0.163 9861	0.284 7991
27	43 20 0.7	34 1.44	10.4	0 10 46.8	65.63	0.164 7084	0.282 9218
29	44 27 56.7	33 54.62	8.3	0 8 35.6	65.53	0.165 4351	0.281 0031
31	45 35 39.1	33 47.78	-6.2	-0 6 24.7	+65.40	0.166 1657	0.279 0432
Aug. 2	46 43 7.8	33 40.93	4.1	0 4 14.1	65.24	0.166 9001	0.277 0391
4	47 50 22.8	33 34.07	-2.0	-0 2 3.8	65.05	0.167 6377	0.274 9894
6	48 57 24.0	33 27.20	+0.1	+0 0 6.1	64.84	0.168 3786	0.272 8931
8	50 4 11.6	33 20.34	2.2	0 2 15.6	64.60	0.169 1219	0.270 7492
10	51 10 45.4	33 13.48	+4.3	+0 4 24.5	+64.34	0.169 8677	0.268 5561
12	52 17 5.5	33 6.63	6.3	0 6 32.9	64.06	0.170 6158	0.266 3141
14	53 23 11.9	32 59.80	8.4	0 8 40.8	63.76	0.171 3655	0.264 0212
16	54 29 4.7	32 52.96	10.4	0 10 47.9	63.43	0.172 1169	0.261 6776
18	55 34 43.8	32 46.14	12.4	0 12 54.5	63.09	0.172 8694	0.259 2828
20	56 40 9.3	32 39.34	+14.4	+0 15 0.2	+62.72	0.173 6229	0.256 8358
22	57 45 21.1	32 32.56	16.4	0 17 5.3	62.33	0.174 3771	0.254 3357
24	58 50 19.5	32 25.80	18.3	0 19 9.5	61.92	0.175 1316	0.251 7816
26	59 55 4.4	32 19.07	20.2	0 21 13.0	61.49	0.175 8862	0.249 1721
28	60 59 35.8	32 12.36	22.0	0 23 15.5	61.04	0.176 6406	0.246 5043
30	62 3 53.8	32 5.67	+23.8	+0 25 17.1	+60.57	0.177 3945	0.243 7771
Sept. 1	63 7 58.5	31 59.02	25.6	0 27 17.7	60.09	0.178 1477	0.240 9886
3	64 11 49.9	31 52.39	27.4	0 29 17.4	59.59	0.178 8999	0.238 1377
5	65 15 28.1	31 45.81	29.1	0 31 16.1	59.07	0.179 6509	0.235 2221
7	66 18 53.2	31 39.26	30.7	0 33 13.7	58.54	0.180 4004	0.232 2412
9	67 22 5.2	31 32.76	+32.3	+0 35 10.2	+57.99	0.181 1481	0.229 1933
11	68 25 4.3	31 26.29	33.8	0 37 5.6	57.43	0.181 8938	0.226 0775
13	69 27 50.4	31 19.86	35.3	0 38 59.9	56.85	0.182 6373	0.222 8946
15	70 30 23.8	31 13.49	36.8	0 40 53.0	56.26	0.183 3783	0.219 6426
17	71 32 44.5	31 7.16	38.2	0 42 44.9	55.66	0.184 1167	0.216 3211
19	72 34 52.5	31 0.87	+39.5	+0 44 35.5	+55.05	0.184 8521	0.212 9292
21	73 36 48.0	30 54.64	40.8	0 46 25.1	54.42	0.185 5844	0.209 4657
23	74 38 31.1	30 48.45	42.0	0 48 13.3	53.78	0.186 3133	0.205 9287
25	75 40 1.8	30 42.31	43.2	0 50 0.2	53.13	0.187 0387	0.202 3161
27	76 41 20.4	30 36.23	44.3	0 51 45.8	52.47	0.187 7603	0.198 6261
29	77 42 26.8	30 30.20	+45.3	+0 53 30.1	+51.80	0.188 4779	0.194 8568
Oct. 1	78 43 21.2	30 24.22	+46.3	+0 55 13.0	+51.11	0.189 1913	0.191 0062

MARS.

GREENWICH MEAN NOON.

31103



JUPITER.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.			Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.			Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of I Earth
						At Date.					
	°	'	"			°	'	"			
Jan.	0	330	0 6.5	5 21.81	+26.4	-1	0	32.8	-4.68	0.700 2102	0.754 6854
	4	330	21 34.0	5 21.94	26.3	1	0	51.4	4.65	0.700 1248	0.757 8388
	8	330	43 2.1	5 22.07	26.3	1	1	9.9	4.61	0.700 0400	0.760 7687
	12	331	4 30.6	5 22.19	26.2	1	1	28.3	4.58	0.699 9558	0.763 4710
	16	331	25 59.6	5 22.32	26.1	1	1	46.5	4.54	0.699 8721	0.765 9408
	20	331	47 29.2	5 22.44	+26.0	-1	2	4.6	-4.51	0.699 7890	0.768 1743
	24	332	8 59.2	5 22.56	26.0	1	2	22.6	4.47	0.699 7064	0.770 1697
	28	332	30 29.7	5 22.69	25.9	1	2	40.4	4.44	0.699 6244	0.771 9264
Feb.	1	332	52 0.7	5 22.81	25.8	1	2	58.1	4.40	0.699 5429	0.773 4445
	5	333	13 32.1	5 22.93	25.7	1	3	15.7	4.37	0.699 4621	0.774 7237
	9	333	35 4.1	5 23.05	+25.6	-1	3	33.1	-4.33	0.699 3819	0.775 7627
	13	333	56 36.5	5 23.17	25.5	1	3	50.3	4.30	0.699 3022	0.776 5595
	17	334	18 9.4	5 23.29	25.4	1	4	7.4	4.26	0.699 2232	0.777 1125
	21	334	39 42.8	5 23.41	25.2	1	4	24.4	4.22	0.699 1447	0.777 4225
	25	335	1 16.7	5 23.52	25.1	1	4	41.2	4.19	0.699 0669	0.777 4911
Mar.	1	335	22 51.0	5 23.64	+25.0	-1	4	57.9	-4.15	0.698 9897	0.777 3199
	5	335	44 25.8	5 23.75	24.9	1	5	14.4	4.12	0.698 9131	0.776 9108
	9	336	6 1.0	5 23.87	24.7	1	5	30.8	4.08	0.698 8371	0.776 2633
	13	336	27 36.7	5 23.98	24.6	1	5	47.1	4.04	0.698 7618	0.775 3778
	17	336	49 12.9	5 24.09	24.5	1	6	3.2	4.00	0.698 6871	0.774 2542
	21	337	10 49.5	5 24.21	+24.3	-1	6	19.1	-3.96	0.698 6130	0.772 8945
	25	337	32 26.5	5 24.32	24.2	1	6	34.9	3.92	0.698 5396	0.771 3018
	29	337	54 4.0	5 24.43	24.0	1	6	50.5	3.89	0.698 4668	0.769 4791
Apr.	2	338	15 42.0	5 24.54	23.9	1	7	6.0	3.85	0.698 3946	0.767 4296
	6	338	37 20.3	5 24.64	23.7	1	7	21.3	3.81	0.698 3230	0.765 1547
	10	338	58 59.1	5 24.75	+23.6	-1	7	36.5	-3.77	0.698 2521	0.762 6556
	14	339	20 38.3	5 24.86	23.4	1	7	51.5	3.73	0.698 1819	0.759 9344
	18	339	42 18.0	5 24.96	23.2	1	8	6.3	3.69	0.698 1123	0.756 9945
	22	340	3 58.0	5 25.07	23.0	1	8	21.0	3.65	0.698 0433	0.753 8409
	26	340	25 38.5	5 25.17	22.9	1	8	35.5	3.61	0.697 9750	0.750 4791
	30	340	47 19.4	5 25.27	+22.7	-1	8	49.9	-3.57	0.697 9074	0.746 9141
May	4	341	9 0.7	5 25.37	22.5	1	9	4.1	3.53	0.697 8404	0.743 1498
	8	341	30 42.4	5 25.47	22.3	1	9	18.2	3.49	0.697 7741	0.739 1901
	12	341	52 24.5	5 25.57	22.1	1	9	32.1	3.45	0.697 7085	0.735 0398
	16	342	14 7.0	5 25.67	21.9	1	9	45.8	3.41	0.697 6436	0.730 7064
	20	342	35 49.9	5 25.77	+21.7	-1	9	59.4	-3.37	0.697 5793	0.726 1982
	24	342	57 33.1	5 25.86	21.5	1	10	12.8	3.33	0.697 5157	0.721 5252
	28	343	19 16.8	5 25.96	21.3	1	10	26.1	3.29	0.697 4527	0.716 6970
June	1	343	41 0.8	5 26.05	21.1	1	10	39.2	3.25	0.697 3905	0.711 7230
	5	344	2 45.2	5 26.15	20.9	1	10	52.1	3.21	0.697 3290	0.706 6121
	9	344	24 30.0	5 26.24	+20.7	-1	11	4.8	-3.17	0.697 2681	0.701 3760
	13	344	46 15.1	5 26.33	20.5	1	11	17.4	3.12	0.697 2080	0.696 0289
	17	345	8 0.6	5 26.42	20.3	1	11	29.8	3.08	0.697 1485	0.690 5878
	21	345	29 46.5	5 26.51	20.0	1	11	42.0	3.04	0.697 0897	0.685 0706
	25	345	51 32.7	5 26.60	19.8	1	11	54.1	3.00	0.697 0317	0.679 4966
	29	346	13 19.3	5 26.68	+19.6	-1	12	6.0	-2.95	0.696 9743	0.673 8841
July	3	346	35 6.2	5 26.77	+19.3	-1	12	17.8	-2.91	0.696 9176	0.668 2530

JUPITER.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.			Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.			Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Distance from Earth—	
											At Date.	At Interme- diate Date.
	°	'	"	'	"	°	'	"	"			
July 3	346	35	6.2	5 26.77	+19.3	-1	12	17.8	-2.91	0.696 9176	0.668 2530	0.665 4375
7	346	56	53.5	5 26.86	19.1	1	12	29.3	2.87	0.696 8616	0.662 6263	0.659 8228
11	347	18	41.1	5 26.94	18.9	1	12	40.7	2.83	0.696 8064	0.657 0306	0.654 2534
15	347	40	29.0	5 27.02	18.6	1	12	51.9	2.78	0.696 7519	0.651 4950	0.648 7594
19	348	2	17.2	5 27.10	18.4	1	13	3.0	2.74	0.696 6981	0.646 0506	0.643 3725
23	348	24	5.8	5 27.18	+18.1	-1	13	13.9	-2.70	0.696 6450	0.640 7291	0.638 1241
27	348	45	54.7	5 27.26	17.9	1	13	24.6	2.65	0.696 5926	0.635 5614	0.633 0451
31	349	7	43.9	5 27.34	17.6	1	13	35.1	2.61	0.696 5410	0.630 5795	0.628 1689
Aug. 4	349	29	33.5	5 27.42	17.4	1	13	45.4	2.56	0.696 4901	0.625 8180	0.623 5314
8	349	51	23.3	5 27.50	17.1	1	13	55.6	2.52	0.696 4399	0.621 3139	0.619 1704
12	350	13	13.4	5 27.57	+16.8	-1	14	5.6	-2.48	0.696 3905	0.617 1056	0.615 1242
16	350	35	3.8	5 27.64	16.6	1	14	15.4	2.43	0.696 3418	0.613 2306	0.611 4289
20	350	56	54.6	5 27.72	16.3	1	14	25.1	2.39	0.696 2938	0.609 7232	0.608 1174
24	351	18	45.6	5 27.79	16.0	1	14	34.5	2.34	0.696 2466	0.606 6151	0.605 2196
28	351	40	36.8	5 27.86	15.7	1	14	43.8	2.30	0.696 2001	0.603 9345	0.602 7634
Sept. 1	352	2	28.4	5 27.93	+15.5	-1	14	52.9	-2.25	0.696 1544	0.601 7095	0.600 7760
5	352	24	20.3	5 28.00	15.2	1	15	1.8	2.21	0.696 1094	0.599 9657	0.599 2813
9	352	46	12.4	5 28.06	14.9	1	15	10.6	2.16	0.696 0651	0.598 7251	0.598 2988
13	353	8	4.8	5 28.13	14.6	1	15	19.2	2.12	0.696 0216	0.598 0038	0.597 8410
17	353	29	57.5	5 28.20	14.3	1	15	27.6	2.07	0.695 9789	0.597 8108	0.597 9128
21	353	51	50.4	5 28.26	+14.0	-1	15	35.8	-2.03	0.695 9369	0.598 1468	0.598 5121
25	354	13	43.6	5 28.32	13.7	1	15	43.8	1.98	0.695 8957	0.599 0080	0.599 6334
29	354	35	37.0	5 28.39	13.4	1	15	51.6	1.94	0.695 8552	0.600 3869	0.601 2670
Oct. 3	354	57	30.6	5 28.45	13.1	1	15	59.3	1.89	0.695 8154	0.602 2718	0.603 3991
7	355	19	24.5	5 28.50	12.8	1	16	6.7	1.84	0.695 7765	0.604 6462	0.606 0102
11	355	41	18.7	5 28.56	+12.5	-1	16	14.0	-1.80	0.695 7383	0.607 4877	0.609 0746
15	356	3	13.0	5 28.62	12.2	1	16	21.1	1.75	0.695 7009	0.610 7669	0.612 5602
19	356	25	7.6	5 28.68	11.9	1	16	28.0	1.71	0.695 6643	0.614 4502	0.616 4325
23	356	47	2.4	5 28.73	11.6	1	16	34.8	1.66	0.695 6284	0.618 5026	0.620 6562
27	357	8	57.5	5 28.78	11.3	1	16	41.3	1.61	0.695 5933	0.622 8890	0.625 1967
31	357	30	52.7	5 28.84	+11.0	-1	16	47.7	-1.57	0.695 5590	0.627 5747	0.630 0182
Nov. 4	357	52	48.2	5 28.89	10.7	1	16	53.8	1.52	0.695 5255	0.632 5227	0.635 0837
8	358	14	43.8	5 28.94	10.4	1	16	59.8	1.47	0.695 4928	0.637 6964	0.640 3556
12	358	36	39.7	5 28.99	10.0	1	17	5.6	1.43	0.695 4608	0.643 0563	0.645 7938
16	358	58	35.7	5 29.03	9.7	1	17	11.2	1.38	0.695 4296	0.648 5638	0.651 3617
20	359	20	31.9	5 29.08	+ 9.4	-1	17	16.7	-1.33	0.695 3992	0.654 1831	0.657 0241
24	359	42	28.3	5 29.12	9.1	1	17	21.9	1.29	0.695 3696	0.659 8812	0.662 7508
28	0	4	24.9	5 29.17	8.8	1	17	27.0	1.24	0.695 3407	0.665 6293	0.668 5129
Dec. 2	0	26	21.7	5 29.21	8.5	1	17	31.8	1.19	0.695 3127	0.671 3982	0.674 2818
6	0	48	18.6	5 29.25	8.1	1	17	36.5	1.14	0.695 2854	0.677 1602	0.680 0301
10	1	10	15.7	5 29.29	+ 7.8	-1	17	41.0	-1.10	0.695 2589	0.682 8882	0.685 7311
14	1	32	13.0	5 29.33	7.5	1	17	45.3	1.05	0.695 2332	0.688 5560	0.691 3604
18	1	54	10.4	5 29.37	7.1	1	17	49.4	1.00	0.695 2083	0.694 1419	0.696 8981
22	2	16	8.0	5 29.41	6.8	1	17	53.3	0.95	0.695 1842	0.699 6271	0.702 3269
26	2	38	5.7	5 29.44	6.5	1	17	57.0	0.91	0.695 1609	0.704 9955	0.707 6310
30	3	0	3.5	5 29.48	+ 6.2	-1	18	0.6	-0.86	0.695 1384	0.710 2317	0.712 7958
34	3	22	1.5	5 29.51	+ 5.9	-1	18	3.9	-0.81	0.695 1166	0.715 3216	

SATURN.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.			Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.			Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Ea	
	°	'	"			°	'	"			At Date.	
Jan.	0	89	12 37.0	2 14.74	-I 11.8	-I	0	13.2	+5.36	0.954 9047	0.905	6163
	4	89	21 35.9	2 14.74	I 11.4	0	59	51.8	5.37	0.954 9027	0.906	4414
	8	89	30 34.9	2 14.74	I 11.1	0	59	30.3	5.37	0.954 9009	0.907	5275
	12	89	39 33.8	2 14.74	I 10.8	0	59	8.8	5.38	0.954 8993	0.908	8669
	16	89	48 32.8	2 14.74	I 10.5	0	58	47.3	5.39	0.954 8978	0.910	4495
	20	89	57 31.8	2 14.74	-I 10.1	-0	58	25.7	+5.39	0.954 8965	0.912	2622
	24	90	6 30.7	2 14.74	I 9.8	0	58	4.1	5.40	0.954 8953	0.914	2902
	28	90	15 29.7	2 14.74	I 9.4	0	57	42.5	5.40	0.954 8943	0.916	5164
Feb.	1	90	24 28.7	2 14.74	I 9.0	0	57	20.9	5.41	0.954 8934	0.918	9241
	5	90	33 27.6	2 14.74	I 8.7	0	56	59.2	5.42	0.954 8927	0.921	4963
	9	90	42 26.6	2 14.74	-I 8.3	-0	56	37.6	+5.42	0.954 8922	0.924	2164
	13	90	51 25.6	2 14.74	I 8.0	0	56	15.9	5.43	0.954 8918	0.927	0669
	17	91	0 24.6	2 14.75	I 7.6	0	55	54.1	5.43	0.954 8916	0.930	0276
	21	91	9 23.6	2 14.75	I 7.2	0	55	32.4	5.44	0.954 8915	0.933	0802
	25	91	18 22.5	2 14.75	I 6.8	0	55	10.6	5.44	0.954 8916	0.936	2052
Mar.	1	91	27 21.5	2 14.75	-I 6.5	-0	54	48.8	+5.45	0.954 8919	0.939	3845
	5	91	36 20.5	2 14.75	I 6.1	0	54	27.0	5.46	0.954 8922	0.942	6017
	9	91	45 19.5	2 14.75	I 5.7	0	54	5.2	5.46	0.954 8927	0.945	8410
	13	91	54 18.5	2 14.75	I 5.4	0	53	43.3	5.47	0.954 8935	0.949	0870
	17	92	3 17.5	2 14.75	I 5.0	0	53	21.4	5.47	0.954 8944	0.952	3236
	21	92	12 16.4	2 14.74	-I 4.6	-0	52	59.5	+5.48	0.954 8954	0.955	5355
	25	92	21 15.4	2 14.74	I 4.2	0	52	37.6	5.48	0.954 8966	0.958	7083
	29	92	30 14.4	2 14.74	I 3.8	0	52	15.7	5.49	0.954 8979	0.961	8294
Apr.	2	92	39 13.4	2 14.74	I 3.4	0	51	53.7	5.49	0.954 8994	0.964	8876
	6	92	48 12.4	2 14.74	I 3.0	0	51	31.7	5.50	0.954 9011	0.967	8728
	10	92	57 11.3	2 14.74	-I 2.7	-0	51	9.7	+5.50	0.954 9029	0.970	7752
	14	93	6 10.3	2 14.74	I 2.3	0	50	47.7	5.51	0.954 9049	0.973	5847
	18	93	15 9.3	2 14.74	I 1.9	0	50	25.6	5.51	0.954 9070	0.976	2917
	22	93	24 8.2	2 14.74	I 1.5	0	50	3.6	5.52	0.954 9093	0.978	8876
	26	93	33 7.2	2 14.74	I 1.1	0	49	41.5	5.53	0.954 9117	0.981	3655
	30	93	42 6.1	2 14.74	-I 0.7	-0	49	19.4	+5.53	0.954 9143	0.983	7196
May	4	93	51 5.1	2 14.74	I 0.3	0	48	57.2	5.54	0.954 9171	0.985	9449
	8	94	0 4.0	2 14.73	0 59.9	0	48	35.1	5.54	0.954 9200	0.988	0364
	12	94	9 3.0	2 14.73	0 59.5	0	48	12.9	5.54	0.954 9231	0.989	9884
	16	94	18 1.9	2 14.73	0 59.1	0	47	50.7	5.55	0.954 9263	0.991	7959
	20	94	27 0.8	2 14.73	-0 58.7	-0	47	28.5	+5.55	0.954 9297	0.993	4547
	24	94	35 59.7	2 14.73	0 58.2	0	47	6.3	5.56	0.954 9332	0.994	9615
	28	94	44 58.6	2 14.73	0 57.8	0	46	44.1	5.56	0.954 9369	0.996	3144
June	1	94	53 57.5	2 14.72	0 57.4	0	46	21.8	5.57	0.954 9408	0.997	5119
	5	95	2 56.4	2 14.72	0 57.0	0	45	59.5	5.57	0.954 9448	0.998	5516
	9	95	11 55.3	2 14.72	-0 56.6	-0	45	37.2	+5.58	0.954 9490	0.999	4310
	13	95	20 54.2	2 14.72	0 56.2	0	45	14.9	5.58	0.954 9533	1.000	1480
	17	95	29 53.1	2 14.72	0 55.8	0	44	52.5	5.59	0.954 9578	1.000	7009
	21	95	38 51.9	2 14.71	0 55.4	0	44	30.2	5.59	0.954 9625	1.001	0892
	25	95	47 50.8	2 14.71	0 54.9	0	44	7.8	5.60	0.954 9673	1.001	3131
	29	95	56 49.6	2 14.71	-0 54.5	-0	43	45.4	+5.60	0.954 9723	1.001	3731
July	3	96	5 48.5	2 14.71	-0 54.1	-0	43	23.0	+5.61	0.954 9774	1.001	2691

SATURN.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Distance from Earth—	
							At Date.	At Interme- diate Date.
	° ' "	' "	' "	° ' "	"			
July 3	96 5 48.5	2 14.71	—0 54.1	—0 43 23.0	+5.61	0.954 9774	1.001 2691	1.001 1555
7	96 14 47.3	2 14.70	0 53.7	0 43 0.6	5.61	0.954 9827	1.001 0007	1.000 8047
11	96 23 46.1	2 14.70	0 53.2	0 42 38.1	5.61	0.954 9881	1.000 5675	1.000 2891
15	96 32 44.9	2 14.70	0 52.8	0 42 15.7	5.62	0.954 9937	0.999 9699	0.999 6099
19	96 41 43.7	2 14.70	0 52.4	0 41 53.2	5.62	0.954 9995	0.999 2095	0.998 7689
23	96 50 42.5	2 14.69	—0 52.0	—0 41 30.7	+5.63	0.955 0054	0.998 2885	0.997 7685
27	96 59 41.2	2 14.69	0 51.5	0 41 8.2	5.63	0.955 0115	0.997 2093	0.996 6110
31	97 8 40.0	2 14.69	0 51.1	0 40 45.7	5.63	0.955 0177	0.995 9738	0.995 2978
Aug. 4	97 17 38.7	2 14.68	0 50.6	0 40 23.1	5.64	0.955 0241	0.994 5833	0.993 8306
8	97 26 37.4	2 14.68	0 50.2	0 40 0.6	5.64	0.955 0306	0.993 0401	0.992 2121
12	97 35 36.1	2 14.68	—0 49.8	—0 39 38.0	+5.65	0.955 0373	0.991 3468	0.990 4450
16	97 44 34.8	2 14.67	0 49.3	0 39 15.4	5.65	0.955 0442	0.989 5072	0.988 5343
20	97 53 33.5	2 14.67	0 48.9	0 38 52.8	5.65	0.955 0512	0.987 5267	0.986 4850
24	98 2 32.2	2 14.66	0 48.4	0 38 30.2	5.66	0.955 0584	0.985 4099	0.984 3020
28	98 11 30.8	2 14.66	0 48.0	0 38 7.5	5.66	0.955 0657	0.983 1618	0.981 9898
Sept. 1	98 20 29.5	2 14.66	—0 47.6	—0 37 44.9	+5.66	0.955 0732	0.980 7867	0.979 5532
5	98 29 28.1	2 14.65	0 47.1	0 37 22.2	5.67	0.955 0808	0.978 2901	0.976 9983
9	98 38 26.7	2 14.65	0 46.7	0 36 59.5	5.67	0.955 0886	0.975 6786	0.974 3321
13	98 47 25.3	2 14.64	0 46.2	0 36 36.8	5.68	0.955 0965	0.972 9599	0.971 5632
17	98 56 23.9	2 14.64	0 45.8	0 36 14.1	5.68	0.955 1046	0.970 1431	0.968 7008
21	99 5 22.4	2 14.64	—0 45.3	—0 35 51.4	+5.68	0.955 1129	0.967 2375	0.965 7543
25	99 14 21.0	2 14.63	0 44.9	0 35 28.7	5.69	0.955 1213	0.964 2525	0.962 7331
29	99 23 19.5	2 14.63	0 44.4	0 35 5.9	5.69	0.955 1298	0.961 1974	0.959 6466
Oct. 3	99 32 18.0	2 14.62	0 44.0	0 34 43.2	5.69	0.955 1385	0.958 0822	0.956 5059
7	99 41 16.5	2 14.62	0 43.5	0 34 20.4	5.70	0.955 1474	0.954 9193	0.953 3241
11	99 50 14.9	2 14.61	—0 43.0	—0 33 57.6	+5.70	0.955 1564	0.951 7219	0.950 1148
15	99 59 13.4	2 14.61	0 42.6	0 33 34.8	5.70	0.955 1656	0.948 5047	0.946 8936
19	100 8 11.8	2 14.60	0 42.1	0 33 12.0	5.71	0.955 1749	0.945 2831	0.943 6750
23	100 17 10.2	2 14.60	0 41.7	0 32 49.2	5.71	0.955 1844	0.942 0712	0.940 4738
27	100 26 8.6	2 14.59	0 41.2	0 32 26.3	5.71	0.955 1941	0.938 8846	0.937 3056
31	100 35 6.9	2 14.59	—0 40.8	—0 32 3.5	+5.71	0.955 2039	0.935 7390	0.934 1870
Nov. 4	100 44 5.2	2 14.58	0 40.3	0 31 40.6	5.72	0.955 2138	0.932 6518	0.931 1359
8	100 53 3.5	2 14.58	0 39.8	0 31 17.7	5.72	0.955 2239	0.929 6417	0.928 1715
12	101 2 1.8	2 14.57	0 39.4	0 30 54.8	5.72	0.955 2342	0.926 7277	0.925 3127
16	101 11 0.1	2 14.56	0 38.9	0 30 31.9	5.73	0.955 2446	0.923 9287	0.922 5780
20	101 19 58.3	2 14.56	—0 38.4	—0 30 9.0	+5.73	0.955 2552	0.921 2626	0.919 9847
24	101 28 56.6	2 14.55	0 38.0	0 29 46.1	5.73	0.955 2659	0.918 7465	0.917 5500
28	101 37 54.8	2 14.55	0 37.5	0 29 23.2	5.74	0.955 2768	0.916 3975	0.915 2912
Dec. 2	101 46 52.9	2 14.54	0 37.0	0 29 0.2	5.74	0.955 2878	0.914 2332	0.913 2256
6	101 55 51.1	2 14.53	0 36.6	0 28 37.3	5.74	0.955 2990	0.912 2706	0.911 3703
10	102 4 49.2	2 14.53	—0 36.1	—0 28 14.3	+5.74	0.955 3104	0.910 5266	0.909 7411
14	102 13 47.3	2 14.52	0 35.6	0 27 51.3	5.75	0.955 3219	0.909 0153	0.908 3505
18	102 22 45.4	2 14.51	0 35.1	0 27 28.3	5.75	0.955 3335	0.907 7480	0.907 2089
22	102 31 43.4	2 14.51	0 34.7	0 27 5.3	5.75	0.955 3453	0.906 7342	0.906 3250
26	102 40 41.4	2 14.50	0 34.2	0 26 42.3	5.75	0.955 3573	0.905 9822	0.905 7066
30	102 49 39.4	2 14.49	—0 33.7	—0 26 19.3	+5.76	0.955 3694	0.905 4988	0.905 3596
34	102 58 37.4	2 14.49	—0 33.2	—0 25 56.3	+5.76	0.955 3817	0.905 2894	0.905 2884

URANUS.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.	Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.	Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm o Ea
							At Date.
	° ' "	"	"	° ' "	"		
Jan. 4	311 19 58.)	39.48	+8.4	— 39 11.7	— 0.28	1.298 6363	1.317 2525
12	311 25 14.7	39.47	8.5	0 39 14.0	0.28	1.298 6557	1.318 4110
20	311 30 30.5	39.47	8.5	0 39 16.2	0.28	1.298 6751	1.319 2068
28	311 35 46.2	39.47	8.5	0 39 18.5	0.28	1.298 6945	1.319 6291
Feb. 5	311 41 1.9	39.46	8.5	0 39 20.8	0.28	1.298 7139	1.319 6755
13	311 46 17.6	39.46	+8.4	— 39 23.0	— 0.28	1.298 7331	1.319 3464
21	311 51 33.3	39.46	8.4	0 39 25.2	0.28	1.298 7523	1.318 6458
Mar. 1	311 56 48.9	39.45	8.4	0 39 27.5	0.28	1.298 7715	1.317 5880
9	312 2 4.5	39.45	8.4	0 39 29.7	0.28	1.298 7907	1.316 1915
17	312 7 20.1	39.44	8.4	0 39 32.0	0.28	1.298 8097	1.314 4763
25	312 12 35.6	39.44	+8.3	— 39 34.2	— 0.28	1.298 8287	1.312 4699
Apr. 2	312 17 51.1	39.44	8.3	0 39 36.4	0.28	1.298 8477	1.310 2069
10	312 23 6.6	39.43	8.3	0 39 38.6	0.28	1.298 8667	1.307 7228
18	312 28 22.0	39.43	8.3	0 39 40.8	0.28	1.298 8857	1.305 0566
26	312 33 37.4	39.42	8.3	0 39 43.0	0.28	1.298 9045	1.302 2551
May 4	312 38 52.8	39.42	+8.3	— 39 45.2	— 0.28	1.298 9233	1.299 3667
12	312 44 8.2	39.42	8.3	0 39 47.4	0.27	1.298 9420	1.296 4398
20	312 49 23.5	39.42	8.2	0 39 49.6	0.27	1.298 9607	1.293 5279
28	312 54 38.8	39.41	8.2	0 39 51.8	0.27	1.298 9793	1.290 6873
June 5	312 59 54.0	39.41	8.2	0 39 54.0	0.27	1.298 9979	1.287 9709
13	313 5 9.3	39.41	+8.2	— 39 56.1	— 0.27	1.299 0164	1.285 4312
21	313 10 24.5	39.40	8.2	0 39 58.3	0.27	1.299 0349	1.283 1229
29	313 15 39.7	39.40	8.2	0 40 0.4	0.27	1.299 0533	1.281 0947
July 7	313 20 54.8	39.39	8.2	0 40 2.6	0.27	1.299 0717	1.279 3883
15	313 26 9.9	39.39	8.2	0 40 4.7	0.27	1.299 0899	1.278 0438
23	313 31 24.9	39.39	+8.2	— 40 6.9	— 0.27	1.299 1081	1.277 0940
31	313 36 40.0	39.38	8.1	0 40 9.0	0.27	1.299 1264	1.276 5598
Aug. 8	313 41 55.0	39.38	8.1	0 40 11.1	0.27	1.299 1446	1.276 4549
16	313 47 10.0	39.37	8.1	0 40 13.2	0.27	1.299 1627	1.276 7864
24	313 52 24.9	39.37	8.1	0 40 15.3	0.27	1.299 1807	1.277 5470
Sept. 1	313 57 39.9	39.36	+8.1	— 40 17.4	— 0.26	1.299 1987	1.278 7194
9	314 2 54.8	39.36	8.1	0 40 19.5	0.26	1.299 2167	1.280 2811
17	314 8 9.6	39.36	8.0	0 40 21.6	0.26	1.299 2346	1.282 1993
25	314 13 24.4	39.35	8.0	0 40 23.7	0.26	1.299 2525	1.284 4300
Oct. 3	314 18 39.2	39.35	8.0	0 40 25.8	0.26	1.299 2704	1.286 9265
11	314 23 54.0	39.34	+8.0	— 40 27.9	— 0.26	1.299 2882	1.289 6388
19	314 29 8.7	39.34	8.0	0 40 30.0	0.26	1.299 3059	1.292 5097
27	314 34 23.4	39.34	8.0	0 40 32.0	0.26	1.299 3236	1.295 4798
Nov. 4	314 39 38.1	39.33	8.0	0 40 34.1	0.26	1.299 3412	1.298 4933
12	314 44 52.8	39.33	7.9	0 40 36.2	0.25	1.299 3588	1.301 4933
20	314 50 7.4	39.33	+7.9	— 40 38.2	— 0.25	1.299 3763	1.304 4212
28	314 55 22.0	39.32	7.9	0 40 40.2	0.25	1.299 3938	1.307 2259
Dec. 6	315 0 36.5	39.32	7.9	0 40 42.3	0.25	1.299 4112	1.309 8604
14	315 5 51.0	39.31	7.9	0 40 44.3	0.25	1.299 4286	1.312 2777
22	315 11 5.5	39.31	7.9	0 40 46.3	0.25	1.299 4459	1.314 4376
30	315 16 20.0	39.30	+7.8	— 40 48.3	— 0.25	1.299 4631	1.316 3085
38	315 21 34.4	39.30	+7.8	— 40 50.3	— 0.25	1.299 4803	1.317 8610

NEPTUNE.

GREENWICH MEAN NOON.

Date.	Heliocentric Longitude, Mean Equinox of Date.			Daily Motion.	Reduction to Orbit.	Heliocentric Latitude.			Daily Motion.	Logarithm of Radius Vec- tor.	Logarithm of Distance from Earth—	
	°	'	"			°	'	"			At Date.	At Interme- diate Date.
m. 4	118	57	47.3	21.73	-20.0	-0	21	58.3	+0.66	1.477 1163	1.463 2254	1.462 9684
12	119	0	41.1	21.73	19.9	0	21	53.0	0.66	1.477 1198	1.462 7844	1.462 6745
20	119	3	34.9	21.73	19.9	0	21	47.8	0.66	1.477 1234	1.462 6396	1.462 6798
28	119	6	28.7	21.73	19.8	0	21	42.5	0.66	1.477 1269	1.462 7942	1.462 9818
Feb. 5	119	9	22.5	21.73	19.7	0	21	37.3	0.66	1.477 1304	1.463 2417	1.463 5725
13	119	12	16.3	21.73	-19.6	-0	21	32.0	+0.66	1.477 1340	1.463 9723	1.464 4386
21	119	15	10.1	21.73	19.6	0	21	26.7	0.66	1.477 1375	1.464 9685	1.465 5585
Mar. 1	119	18	3.9	21.73	19.5	0	21	21.5	0.66	1.477 1411	1.466 2050	1.466 9042
9	119	20	57.7	21.73	19.4	0	21	16.2	0.66	1.477 1447	1.467 6525	1.468 4459
17	119	23	51.6	21.73	19.3	0	21	10.9	0.66	1.477 1482	1.469 2799	1.470 1499
25	119	26	45.4	21.73	-19.2	-0	21	5.6	+0.66	1.477 1518	1.471 0509	1.471 9780
Apr. 2	119	29	39.2	21.73	19.2	0	21	0.4	0.66	1.477 1554	1.472 9267	1.473 8924
10	119	32	33.0	21.73	19.1	0	20	55.1	0.66	1.477 1590	1.474 8705	1.475 8562
18	119	35	26.8	21.73	19.0	0	20	49.8	0.66	1.477 1626	1.476 8447	1.477 8311
26	119	38	20.6	21.73	19.0	0	20	44.6	0.66	1.477 1662	1.478 8107	1.479 7793
May 4	119	41	14.4	21.73	-18.9	-0	20	39.3	+0.66	1.477 1698	1.480 7330	1.481 6679
12	119	44	8.2	21.73	18.8	0	20	34.0	0.66	1.477 1734	1.482 5800	1.483 4653
20	119	47	2.0	21.73	18.7	0	20	28.7	0.66	1.477 1771	1.484 3199	1.485 1403
28	119	49	55.8	21.73	18.6	0	20	23.4	0.66	1.477 1807	1.485 9234	1.486 6667
June 5	119	52	49.6	21.73	18.6	0	20	18.2	0.66	1.477 1844	1.487 3673	1.488 0225
13	119	55	43.5	21.73	-18.5	-0	20	12.9	+0.66	1.477 1880	1.488 6297	1.489 1863
21	119	58	37.3	21.73	18.4	0	20	7.6	0.66	1.477 1917	1.489 6903	1.490 1401
29	120	1	31.1	21.73	18.3	0	20	2.3	0.66	1.477 1953	1.490 5344	1.490 8719
July 7	120	4	24.9	21.73	18.2	0	19	57.0	0.66	1.477 1990	1.491 1512	1.491 3710
15	120	7	18.7	21.73	18.2	0	19	51.8	0.66	1.477 2027	1.491 5303	1.491 6286
23	120	10	12.5	21.73	-18.1	-0	19	46.5	+0.66	1.477 2064	1.491 6656	1.491 6415
31	120	13	6.4	21.73	18.0	0	19	41.2	0.66	1.477 2101	1.491 5564	1.491 4103
Aug. 8	120	16	0.2	21.73	17.9	0	19	35.9	0.66	1.477 2138	1.491 2035	1.490 9363
16	120	18	54.0	21.73	17.9	0	19	30.6	0.66	1.477 2175	1.490 6097	1.490 2251
24	120	21	47.8	21.73	17.8	0	19	25.3	0.66	1.477 2212	1.489 7840	1.489 2880
Sept. 1	120	24	41.6	21.73	-17.7	-0	19	20.0	+0.66	1.477 2249	1.488 7385	1.488 1374
9	120	27	35.5	21.73	17.6	0	19	14.8	0.66	1.477 2286	1.487 4867	1.486 7889
17	120	30	29.3	21.73	17.6	0	19	9.5	0.66	1.477 2324	1.486 0468	1.485 2636
25	120	33	23.1	21.73	17.5	0	19	4.2	0.66	1.477 2361	1.484 4423	1.483 5860
Oct. 3	120	36	16.9	21.73	17.4	0	18	58.9	0.66	1.477 2398	1.482 6980	1.481 7818
11	120	39	10.8	21.73	-17.3	-0	18	53.6	+0.66	1.477 2436	1.480 8415	1.479 8815
19	120	42	4.6	21.73	17.2	0	18	48.3	0.66	1.477 2473	1.478 9063	1.477 9202
27	120	44	58.4	21.73	17.2	0	18	43.0	0.66	1.477 2510	1.476 9276	1.475 9328
Nov. 4	120	47	52.3	21.73	17.1	0	18	37.7	0.66	1.477 2548	1.474 9405	1.473 9559
12	120	50	46.1	21.73	17.0	0	18	32.4	0.66	1.477 2585	1.472 9843	1.472 0308
20	120	53	39.9	21.73	-16.9	-0	18	27.1	+0.66	1.477 2623	1.471 1002	1.470 1971
28	120	56	33.8	21.73	16.8	0	18	21.8	0.66	1.477 2660	1.469 3263	1.468 4924
Dec. 6	120	59	27.6	21.73	16.8	0	18	16.5	0.66	1.477 2698	1.467 7003	1.466 9547
14	121	2	21.4	21.73	16.7	0	18	11.2	0.66	1.477 2735	1.466 2601	1.465 6203
22	121	5	15.3	21.73	16.6	0	18	5.9	0.66	1.477 2773	1.465 0387	1.464 5185
30	121	8	9.1	21.73	-16.5	-0	18	0.6	+0.66	1.477 2811	1.464 0627	1.463 6743
38	121	11	3.0	21.73	-16.5	-0	17	55.3	+0.66	1.477 2848	1.463 3559	1.463 1097



FOR GREENWICH MEAN NOON AND MIDNIGHT.

Date.	X		Reduc. to Mean Eq'x of Jan. o.	Y		Reduc. to Mean Eq'x of Jan. o.	Z	
	True Equinox.			True Equinox.			True Equinox.	
	Noon.	Midnight.		Noon.	Midnight.		Noon.	Midnight.
Jan. 1	+0.170 8904	+0.179 4931	-429	-0.888 2779	-0.886 8457	-206	-0.385 3545	-0.384 7334
2	0.188 0821	0.196 6565	436	0.885 3447	0.883 7753	214	0.384 0826	0.383 4020
3	0.205 2158	0.213 7593	443	0.882 1374	0.880 4312	223	0.382 6918	0.381 9519
4	0.222 2865	0.230 7967	450	0.878 6567	0.876 8140	232	0.381 1824	0.380 3833
5	0.239 2892	0.247 7635	457	0.874 9032	0.872 9245	241	0.379 5547	0.378 6967
6	+0.256 2189	+0.264 6548	-464	-0.870 8780	-0.868 7639	-250	-0.377 8092	-0.376 8924
7	0.273 0706	0.281 4655	471	0.866 5822	0.864 3331	259	0.375 9463	0.374 9709
8	0.289 8389	0.298 1902	477	0.862 0167	0.859 6331	268	0.373 9662	0.372 9324
9	0.306 5187	0.314 8238	483	0.857 1825	0.854 6651	278	0.371 8695	0.370 7775
10	0.323 1047	0.331 3608	489	0.852 0810	0.849 4303	288	0.369 6566	0.368 5068
11	+0.339 5914	+0.347 7958	-495	-0.846 7133	-0.843 9301	-298	-0.367 3281	-0.366 1207
12	0.355 9734	0.364 1235	500	0.841 0809	0.838 1659	308	0.364 8846	0.363 6199
13	0.372 2454	0.380 3384	505	0.835 1853	0.832 1394	318	0.362 3268	0.361 0052
14	0.388 4019	0.396 4351	509	0.829 0285	0.825 8527	329	0.359 6554	0.358 2774
15	0.404 4373	0.412 4079	513	0.822 6123	0.819 3076	340	0.356 8713	0.355 4373
16	+0.420 3463	+0.428 2518	-517	-0.815 9388	-0.812 5064	-351	-0.353 9755	-0.352 4861
17	0.436 1237	0.443 9614	520	0.809 0105	0.805 4515	362	0.350 9692	0.349 4249
18	0.451 7642	0.459 5315	523	0.801 8297	0.798 1455	373	0.347 8534	0.346 2548
19	0.467 2627	0.474 9573	526	0.794 3991	0.790 5910	384	0.344 6292	0.342 9769
20	0.482 6146	0.490 2343	528	0.786 7215	0.782 7909	395	0.341 2979	0.339 5924
21	+0.497 8151	+0.505 3572	-530	-0.778 7995	-0.774 7477	-406	-0.337 8606	-0.336 1027
22	0.512 8597	0.520 3220	532	0.770 6358	0.766 4643	418	0.334 3187	0.332 5088
23	0.527 7435	0.535 1238	533	0.762 2334	0.757 9436	430	0.330 6732	0.328 8120
24	0.542 4622	0.549 7585	534	0.753 5952	0.749 1886	442	0.326 9255	0.325 0138
25	0.557 0119	0.564 2219	534	0.744 7242	0.740 2023	454	0.323 0771	0.321 1154
26	+0.571 3880	+0.578 5097	-534	-0.735 6233	-0.730 9876	-466	-0.319 1290	-0.317 1180
27	0.585 5864	0.592 6178	534	0.726 2956	0.721 5477	478	0.315 0827	0.313 0231
28	0.599 6032	0.606 5422	533	0.716 7442	0.711 8856	490	0.310 9395	0.308 8320
29	0.613 4343	0.620 2791	532	0.706 9722	0.702 0044	502	0.306 7007	0.304 5459
30	0.627 0761	0.633 8247	530	0.696 9826	0.691 9071	514	0.302 3676	0.300 1661
31	+0.640 5245	+0.647 1750	-528	-0.686 7784	-0.681 5969	-526	-0.297 9416	-0.295 6941
Feb. 1	0.653 7757	0.660 3264	526	0.676 3629	0.671 0768	538	0.293 4238	0.291 1309
2	0.666 8264	0.673 2753	523	0.665 7390	0.660 3498	550	0.288 8155	0.286 4779
3	0.679 6725	0.686 0177	520	0.654 9097	0.649 4190	561	0.284 1182	0.281 7365
4	0.692 3103	0.698 5498	516	0.643 8782	0.638 2876	572	0.279 3331	0.276 9080
5	+0.704 7358	+0.710 8679	-512	-0.632 6477	-0.626 9587	-584	-0.274 4615	-0.271 9938
6	0.716 9455	0.722 9683	508	0.621 2211	0.615 4355	596	0.269 5049	0.266 9950
7	0.728 9354	0.734 8467	503	0.609 6021	0.603 7214	607	0.264 4644	0.261 9132
8	0.740 7015	0.746 4995	498	0.597 7939	0.591 8200	618	0.259 3416	0.256 7499
9	0.752 2401	0.757 9229	493	0.585 8001	0.579 7348	629	0.254 1383	0.251 5068
10	+0.763 5473	+0.769 1129	-487	-0.573 6244	-0.567 4695	-640	-0.248 8558	-0.246 1854
11	0.774 6192	0.780 0659	481	0.561 2705	0.555 0280	651	0.243 4959	0.240 7875
12	0.785 4524	0.790 7783	474	0.548 7425	0.542 4145	662	0.238 0604	0.235 3148
13	0.796 0432	0.801 2466	467	0.536 0444	0.529 6329	673	0.232 5509	0.229 7691
14	0.806 3881	0.811 4673	460	0.523 1804	0.516 6876	683	0.226 9695	0.224 1524
15	+0.816 4839	+0.821 4374	-452	-0.510 1549	-0.503 5830	-693	-0.221 3180	-0.218 4666
16	+0.826 3275	+0.831 1539	-444	-0.496 9724	-0.490 3236	-703	-0.215 5984	-0.212 7137

FOR GREENWICH MEAN NOON AND MIDNIGHT.

Date.	X		Reduc. to Mean Eq'x of Jan. o.	Y		Reduc. to Mean Eq'x of Jan. o.	Z		Reduc. to Mean Eq'x of Jan. o.
	True Equinox.	True Equinox.		True Equinox.	True Equinox.		True Equinox.	True Equinox.	
	Noon.	Midnight.	Noon.	Noon.	Midnight.	Noon.	Noon.	Midnight.	Noon.
Feb. 16	+0.826 3275	+0.831 1539	-444	-0.496 9724	-0.490 3236	-703	-0.215 5984	-0.212 7137	- 80
17	0.835 9161	0.840 6138	435	0.483 6373	0.476 9139	713	0.209 8127	0.206 8957	90
18	0.845 2468	0.849 8147	426	0.470 1541	0.463 3583	723	0.203 9629	0.201 0144	100
19	0.854 3172	0.858 7540	417	0.456 5271	0.449 6612	733	0.198 0507	0.195 0719	110
20	0.863 1247	0.867 4291	408	0.442 7611	0.435 8273	742	0.192 0784	0.189 0703	120
21	+0.871 6669	+0.875 8379	-398	-0.428 8605	-0.421 8611	-751	-0.186 0479	-0.183 0114	-130
22	0.879 9418	0.883 9783	388	0.414 8298	0.407 7671	760	0.179 9611	0.176 8972	141
23	0.887 9472	0.891 8482	377	0.400 6735	0.393 5497	769	0.173 8200	0.170 7297	151
24	0.895 6811	0.899 4456	366	0.386 3962	0.379 2135	778	0.167 6265	0.164 5107	161
25	0.903 1416	0.906 7688	355	0.372 0023	0.364 7630	787	0.161 3825	0.158 2422	171
26	+0.910 3270	+0.913 8160	-344	-0.357 4963	-0.350 2027	-795	-0.155 0900	-0.151 9261	-181
27	0.917 2357	0.920 5858	332	0.342 8827	0.335 5369	803	0.148 7509	0.145 5646	191
28	0.923 8662	0.927 0765	320	0.328 1658	0.320 7700	811	0.142 3670	0.139 1589	201
Mar. 1	0.930 2167	0.933 2865	307	0.313 3500	0.305 9064	819	0.135 9402	0.132 7113	211
2	0.936 2859	0.939 2146	294	0.298 4396	0.290 9503	826	0.129 4723	0.126 2235	221
3	+0.942 0725	+0.944 8593	-281	-0.283 4388	-0.275 9058	-833	-0.122 9651	-0.119 6974	-231
4	0.947 5748	0.950 2188	268	0.268 3517	0.260 7772	840	0.116 4205	0.113 1347	241
5	0.952 7912	0.955 2918	254	0.253 1828	0.245 5689	847	0.109 8402	0.106 5372	251
6	0.957 7203	0.960 0765	240	0.237 9362	0.230 2852	854	0.103 2260	0.099 9068	261
7	0.962 3603	0.964 5714	226	0.222 6164	0.214 9305	860	0.096 5799	0.093 2455	271
8	+0.966 7098	+0.968 7752	-212	-0.207 2279	-0.199 5093	-866	-0.089 9038	-0.086 5551	-281
9	0.970 7675	0.972 6864	197	0.191 7752	0.184 0262	872	0.083 1997	0.079 8378	291
10	0.974 5318	0.976 3035	182	0.176 2630	0.168 4861	878	0.076 4696	0.073 0954	300
11	0.978 0013	0.979 6251	167	0.160 6961	0.152 8938	883	0.069 7156	0.066 3303	309
12	0.981 1749	0.982 6505	152	0.145 0794	0.137 2539	888	0.062 9399	0.059 5446	319
13	+0.984 0517	+0.985 3785	-137	-0.129 4179	-0.121 5719	-893	-0.056 1448	-0.052 7406	-328
14	0.986 6309	0.987 8086	121	0.113 7165	0.105 8524	897	0.049 3324	0.045 9204	337
15	0.988 9117	0.989 9399	105	0.097 9802	0.090 1006	901	0.042 5049	0.039 0862	346
16	0.990 8934	0.991 7721	89	0.082 2142	0.074 3217	905	0.035 6646	0.032 2403	355
17	0.992 5759	0.993 3049	72	0.066 4236	0.058 5206	909	0.028 8136	0.025 3849	364
18	+0.993 9590	+0.994 5383	- 55	-0.050 6133	-0.042 7024	-912	-0.021 9543	-0.018 5221	-373
19	0.995 0427	0.995 4722	38	0.034 7885	0.026 8722	915	0.015 0887	0.011 6543	382
20	0.995 8269	0.996 1068	21	0.018 9541	-0.011 0348	918	0.008 2192	-0.004 7836	390
21	0.996 3119	0.996 4423	- 3	-0.003 1150	+0.004 8048	921	-0.001 3478	+0.002 0880	398
22	0.996 4981	0.996 4793	+ 14	+0.012 7239	0.020 6417	923	+0.005 5234	0.008 9582	406
23	+0.996 3860	+0.996 2183	+ 32	+0.028 5577	+0.036 4712	-925	+0.012 3922	+0.015 8251	-414
24	0.995 9762	0.995 6599	50	0.044 3816	0.052 2884	926	0.019 2567	0.022 6866	422
25	0.995 2694	0.994 8049	68	0.060 1910	0.068 0887	927	0.026 1147	0.029 5406	430
26	0.994 2664	0.993 6541	86	0.075 9810	0.083 8674	928	0.032 9642	0.036 3852	438
27	0.992 9680	0.992 2083	104	0.091 7472	0.099 6199	929	0.039 8034	0.043 2185	446
28	+0.991 3752	+0.990 4687	+122	+0.107 4850	+0.115 3420	-929	+0.046 6302	+0.050 0384	-454
29	0.989 4889	0.988 4361	140	0.123 1902	0.131 0291	929	0.053 4429	0.056 8433	461
30	0.987 3103	0.986 1117	159	0.138 8583	0.146 6771	929	0.060 2395	0.063 6313	468
31	0.984 8404	0.983 4965	178	0.154 4851	0.162 2817	929	0.067 0184	0.070 4006	475
Apr. 1	0.982 0801	0.980 5913	197	0.170 0664	0.177 8387	929	0.073 7776	0.077 1492	482
2	+0.979 0302	+0.977 3970	+216	+0.185 5980	+0.193 3439	-928	+0.080 5153	+0.083 8756	-489
3	+0.975 6917	+0.973 9145	+235	+0.201 0758	+0.208 7931	-927	+0.087 2299	+0.090 5779	-496



FOR GREENWICH MEAN NOON AND MIDNIGHT.

Date.	X		Reduc. to Mean Eq'x of Jan. o.	Y		Reduc. to Mean Eq'x of Jan. o.	Z	
	True Equinox.			True Equinox.			True Equinox.	
	Noon.	Midnight.		Noon.	Midnight.		Noon.	Midn
Apr. 1	+0.982 0801	+0.980 5913	+ 197	+0.170 0664	+0.177 8387	-929	+0.073 7776	+0.077
2	0.979 0302	0.977 3970	216	0.185 5980	0.193 3439	928	0.080 5153	0.083
3	0.975 6917	0.973 9145	235	0.201 0758	0.208 7931	927	0.087 2299	0.090
4	0.972 0654	0.970 1446	254	0.216 4954	0.224 1821	926	0.093 9195	0.097
5	0.968 1522	0.966 0884	274	0.231 8526	0.239 5064	925	0.100 5821	0.103
6	+0.963 9533	+0.961 7469	+ 293	+0.247 1429	+0.254 7615	-923	+0.107 2158	+0.110
7	0.959 4695	0.957 1212	313	0.262 3617	0.269 9428	921	0.113 8186	0.117
8	0.954 7021	0.952 2125	333	0.277 5044	0.285 0459	919	0.120 3886	0.123
9	0.949 6524	0.947 0221	353	0.292 5667	0.300 0662	917	0.126 9236	0.130
10	0.944 3218	0.941 5517	373	0.307 5438	0.314 9990	914	0.133 4217	0.136
11	+0.938 7121	+0.935 8031	+ 393	+0.322 4311	+0.329 8396	-911	+0.139 8809	+0.143
12	0.932 8251	0.929 7782	413	0.337 2240	0.344 5837	908	0.146 2991	0.149
13	0.926 6627	0.923 4788	433	0.351 9180	0.359 2264	904	0.152 6742	0.155
14	0.920 2269	0.916 9072	453	0.366 5084	0.373 7634	900	0.159 0043	0.162
15	0.913 5200	0.910 0655	474	0.380 9909	0.388 1903	895	0.165 2874	0.168
16	+0.906 5443	+0.902 9565	+ 494	+0.395 3611	+0.402 5027	-890	+0.171 5216	+0.174
17	0.899 3024	0.895 5824	514	0.409 6146	0.416 6964	885	0.177 7051	0.180
18	0.891 7969	0.887 9461	535	0.423 7474	0.430 7671	880	0.183 8361	0.186
19	0.884 0304	0.880 0501	556	0.437 7551	0.444 7108	875	0.189 9127	0.192
20	0.876 0057	0.871 8974	577	0.451 6337	0.458 5233	869	0.195 9332	0.198
21	+0.867 7257	+0.863 4908	+ 597	+0.465 3792	+0.472 2009	-863	+0.201 8958	+0.204
22	0.859 1932	0.854 8331	618	0.478 9879	0.485 7397	857	0.207 7990	0.210
23	0.850 4111	0.845 9274	639	0.492 4559	0.499 1360	851	0.213 6410	0.216
24	0.841 3827	0.836 7771	660	0.505 7795	0.512 3860	844	0.219 4203	0.222
25	0.832 1112	0.827 3853	681	0.518 9551	0.525 4864	837	0.225 1355	0.227
26	+0.822 5997	+0.817 7548	+ 702	+0.531 9794	+0.538 4338	-830	+0.230 7850	+0.233
27	0.812 8510	0.807 8887	723	0.544 8491	0.551 2250	822	0.236 3676	0.239
28	0.802 8683	0.797 7902	744	0.557 5610	0.563 8568	814	0.241 8818	0.244
29	0.792 6547	0.787 4622	765	0.570 1119	0.576 3260	806	0.247 3264	0.250
30	0.782 2130	0.776 9075	786	0.582 4986	0.588 6294	797	0.252 6999	0.255
May 1	+0.771 5460	+0.766 1289	+ 807	+0.594 7180	+0.600 7640	-788	+0.258 0010	+0.260
2	0.760 6565	0.755 1293	828	0.606 7669	0.612 7265	779	0.263 2283	0.265
3	0.749 5476	0.743 9118	849	0.618 6422	0.624 5137	769	0.268 3803	0.270
4	0.738 2222	0.732 4793	870	0.630 3405	0.636 1222	759	0.273 4557	0.275
5	0.726 6833	0.720 8347	890	0.641 8584	0.647 5486	749	0.278 4530	0.280
6	+0.714 9338	+0.708 9811	+ 911	+0.653 1924	+0.658 7895	-739	+0.283 3706	+0.285
7	0.702 9770	0.696 9220	932	0.664 3394	0.669 8417	728	0.288 2069	0.290
8	0.690 8165	0.684 6609	953	0.675 2959	0.680 7016	717	0.292 9605	0.295
9	0.678 4558	0.672 2015	974	0.686 0584	0.691 3660	706	0.297 6301	0.299
10	0.665 8985	0.659 5473	994	0.696 6239	0.701 8318	694	0.302 2142	0.304
11	+0.653 1484	+0.646 7023	+1015	+0.706 9892	+0.712 0957	-682	+0.306 7112	+0.308
12	0.640 2094	0.633 6703	1036	0.717 1510	0.722 1546	670	0.311 1199	0.313
13	0.627 0855	0.620 4555	1056	0.727 1063	0.732 0056	657	0.315 4388	0.317
14	0.613 7808	0.607 0619	1076	0.736 8523	0.741 6460	644	0.319 6668	0.321
15	0.600 2994	0.593 4938	1096	0.746 3863	0.751 0729	631	0.323 8027	0.325
16	+0.586 6456	+0.579 7554	+1116	+0.755 7054	+0.760 2835	-617	+0.327 8451	+0.329
17	+0.572 8238	+0.565 8512	+1136	+0.764 8070	+0.769 2755	-603	+0.331 7931	+0.333

FOR GREENWICH MEAN NOON AND MIDNIGHT.

Date.	X		Reduc. to Mean Eq'x of Jan. o.	Y		Reduc. to Mean Eq'x of Jan. o.	Z		Reduc. to Mean Eq'x of Jan. o.
	True Equinox.	True Equinox.		True Equinox.	True Equinox.		True Equinox.	True Equinox.	
	Noon.	Midnight.	Noon.	Noon.	Midnight.	Noon.	Noon.	Midnight.	Noon.
May 17	+0.572 8238	+0.565 8512	+1136	+0.764 8070	+0.769 2755	-603	+0.331 7931	+0.333 7314	-572
18	0.558 8382	0.551 7853	1156	0.773 6886	0.778 0460	589	0.335 6456	0.337 5356	568
19	0.544 6931	0.537 5622	1176	0.782 3476	0.786 5930	574	0.339 4014	0.341 2427	564
20	0.530 3931	0.523 1864	1195	0.790 7820	0.794 9143	559	0.343 0596	0.344 8519	560
21	0.515 9427	0.508 6626	1215	0.798 9896	0.803 0077	544	0.346 6194	0.348 3621	556
22	+0.501 3465	+0.493 9951	+1234	+0.806 9683	+0.810 8712	-528	+0.350 0799	+0.351 7727	-551
23	0.486 6088	0.479 1883	1253	0.814 7162	0.818 5031	512	0.353 4404	0.355 0829	546
24	0.471 7341	0.464 2467	1272	0.822 2316	0.825 9015	495	0.356 7001	0.358 2919	541
25	0.456 7267	0.449 1746	1291	0.829 5127	0.833 0650	478	0.359 8582	0.361 3990	536
26	0.441 5910	0.433 9764	1310	0.836 5581	0.839 9919	461	0.362 9143	0.364 4039	530
27	+0.426 3313	+0.418 6562	+1328	+0.843 3663	+0.846 6810	-443	+0.365 8677	+0.367 3056	-524
28	0.410 9516	0.403 2181	1346	0.849 9358	0.853 1306	425	0.368 7176	0.370 1036	518
29	0.395 4561	0.387 6662	1364	0.856 2652	0.859 3394	407	0.371 4635	0.372 7973	512
30	0.379 8488	0.372 0044	1382	0.862 3530	0.865 3057	388	0.374 1048	0.375 3859	506
31	0.364 1335	0.356 2366	1399	0.868 1974	0.871 0279	369	0.376 6406	0.377 8688	499
June 1	+0.348 3142	+0.340 3670	+1416	+0.873 7970	+0.876 5045	-350	+0.379 0704	+0.380 2452	-492
2	0.332 3954	0.324 4000	1433	0.879 1502	0.881 7338	331	0.381 3932	0.382 5143	485
3	0.316 3812	0.308 3396	1450	0.884 2552	0.886 7141	311	0.383 6084	0.384 6754	478
4	0.300 2758	0.292 1903	1467	0.889 1103	0.891 4436	291	0.385 7152	0.386 7277	470
5	0.284 0838	0.275 9568	1483	0.893 7139	0.895 9210	271	0.387 7129	0.388 6707	462
6	+0.267 8098	+0.259 6435	+1499	+0.898 0648	+0.900 1449	-250	+0.389 6009	+0.390 5035	-454
7	0.251 4585	0.243 2553	1515	0.902 1613	0.904 1137	229	0.391 3784	0.392 2256	446
8	0.235 0346	0.226 7969	1530	0.906 0021	0.907 8263	207	0.393 0449	0.393 8363	437
9	0.218 5428	0.210 2730	1545	0.909 5861	0.911 2814	185	0.394 5998	0.395 3353	428
10	0.201 9881	0.193 6888	1559	0.912 9121	0.914 4780	163	0.396 0427	0.396 7220	419
11	+0.185 3756	+0.177 0491	+1573	+0.915 9789	+0.917 4148	-141	+0.397 3730	+0.397 9957	-410
12	0.168 7100	0.160 3589	1587	0.918 7856	0.920 0912	118	0.398 5902	0.399 1564	400
13	0.151 9964	0.143 6232	1601	0.921 3316	0.922 5065	95	0.399 6943	0.400 2038	390
14	0.135 2399	0.126 8471	1614	0.923 6162	0.924 6601	71	0.400 6848	0.401 1373	380
15	0.118 4455	0.110 0356	1627	0.925 6384	0.926 5511	47	0.401 5614	0.401 9570	370
16	+0.101 6182	+0.093 1938	+1639	+0.927 3982	+0.928 1796	-23	+0.402 3241	+0.402 6627	-360
17	0.084 7631	0.076 3267	1651	0.928 8953	0.929 5452	+1	0.402 9728	0.403 2544	349
18	0.067 8853	0.059 4395	1663	0.930 1294	0.930 6477	25	0.403 5074	0.403 7319	338
19	0.050 9899	0.042 5371	1674	0.931 1003	0.931 4871	50	0.403 9279	0.404 0954	327
20	0.034 0816	0.025 6241	1685	0.931 8082	0.932 0636	75	0.404 2344	0.404 3449	316
21	+0.017 1653	+0.008 7057	+1695	+0.932 2533	+0.932 3774	+101	+0.404 4269	+0.404 4804	-305
22	+0.000 2460	-0.008 2134	1705	0.932 4358	0.932 4287	127	0.404 5056	0.404 5024	294
23	-0.016 6718	0.025 1286	1714	0.932 3561	0.932 2181	153	0.404 4709	0.404 4110	282
24	0.033 5837	0.042 0358	1722	0.932 0147	0.931 7460	179	0.404 3228	0.404 2063	270
25	0.050 4848	0.058 9300	1730	0.931 4120	0.931 0128	206	0.404 0615	0.403 8885	258
26	-0.067 3710	-0.075 8072	+1738	+0.930 5484	+0.930 0190	+233	+0.403 6872	+0.403 4578	-246
27	0.084 2381	0.092 6632	1745	0.929 4245	0.928 7649	260	0.403 2001	0.402 9142	234
28	0.101 0819	0.109 4936	1752	0.928 0403	0.927 2507	287	0.402 6002	0.402 2580	222
29	0.117 8978	0.126 2940	1758	0.926 3962	0.925 4768	314	0.401 8877	0.401 4892	209
30	0.134 6816	0.143 0600	1764	0.924 4925	0.923 4434	342	0.401 0625	0.400 6077	197
y 1	-0.151 4288	-0.159 7873	+1769	+0.922 3295	+0.921 1508	+370	+0.400 1248	+0.399 6138	-184
2	-0.168 1350	-0.176 4712	+1773	+0.919 9075	+0.918 5994	+398	+0.399 0747	+0.398 5075	-171

**SUN'S CO-ORDINATES, 1915.**  
**FOR GREENWICH MEAN NOON AND MIDNIGHT.**

FOR GREENWICH MEAN NOON AND MIDNIGHT.

Date.	X		Reduc. to Mean Eq'x of Jan. o.	Y		Reduc. to Mean Eq'x of Jan. o.	Z		Reduc. to Mean Eq'x of Jan. o.
	True Equinox.			True Equinox.			True Equinox.		
	Noon.	Midnight.		Noon.	Midnight.		Noon.	Midnight.	
Aug. 16	-0.803 6850	-0.808 7457	+1311	+0.565 0216	+0.558 7615	+1650	+0.245 1149	+0.242 3990	+494
17	0.813 7485	0.818 6929	1286	0.552 4617	0.546 1228	1673	0.239 6660	0.236 9161	508
18	0.823 5787	0.828 4055	1260	0.539 7452	0.533 3295	1696	0.234 1495	0.231 3663	522
19	0.833 1730	0.837 8808	1234	0.526 8760	0.520 3852	1718	0.228 5668	0.225 7512	537
20	0.842 5287	0.847 1164	1207	0.513 8577	0.507 2939	1739	0.222 9197	0.220 0725	551
21	-0.851 6436	-0.856 1101	+1180	+0.500 6943	+0.494 0593	+1760	+0.217 2097	+0.214 3316	+565
22	0.860 5155	0.864 8596	1152	0.487 3893	0.480 6848	1781	0.211 4384	0.208 5302	579
23	0.869 1421	0.873 3627	1123	0.473 9462	0.467 1740	1801	0.205 6073	0.202 6697	593
24	0.877 5210	0.881 6168	1094	0.460 3687	0.453 5306	1821	0.199 7178	0.196 7517	607
25	0.885 6498	0.889 6197	1064	0.446 6603	0.439 7581	1840	0.193 7715	0.190 7775	621
26	-0.893 5263	-0.897 3692	+1034	+0.432 8244	+0.425 8598	+1859	+0.187 7699	+0.184 7488	+635
27	0.901 1481	0.904 8628	1003	0.418 8646	0.411 8394	1877	0.181 7145	0.178 6670	648
28	0.908 5129	0.912 0982	972	0.404 7845	0.397 7004	1895	0.175 6066	0.172 5335	661
29	0.915 6183	0.919 0729	940	0.390 5877	0.383 4467	1912	0.169 4480	0.166 3502	674
30	0.922 4618	0.925 7847	908	0.376 2780	0.369 0820	1929	0.163 2404	0.160 1186	687
31	-0.929 0412	-0.932 2310	+ 875	+0.361 8591	+0.354 6099	+1945	+0.156 9852	+0.153 8403	+700
Sept. 1	0.935 3539	0.938 4096	842	0.347 3350	0.340 0348	1961	0.150 6842	0.147 5171	712
2	0.941 3978	0.944 3183	809	0.332 7098	0.325 3605	1976	0.144 3392	0.141 1507	724
3	0.947 1707	0.949 9548	775	0.317 9874	0.310 5910	1991	0.137 9518	0.134 7428	736
4	0.952 6704	0.955 3172	741	0.303 1719	0.295 7306	2005	0.131 5239	0.128 2954	748
5	-0.957 8949	-0.960 4033	+ 706	+0.288 2676	+0.280 7835	+2019	+0.125 0576	+0.121 8105	+760
6	0.962 8421	0.965 2111	671	0.273 2789	0.265 7542	2032	0.118 5545	0.115 2898	772
7	0.967 5100	0.969 7387	636	0.258 2100	0.250 6469	2044	0.112 0166	0.108 7352	783
8	0.971 8969	0.973 9844	600	0.243 0654	0.235 4661	2056	0.105 4458	0.102 1487	794
9	0.976 0009	0.977 9464	564	0.227 8496	0.220 2166	2067	0.098 8442	0.095 5326	805
10	-0.979 8205	-0.981 6232	+ 527	+0.212 5676	+0.204 9032	+2078	+0.092 2140	+0.088 8888	+816
11	0.983 3544	0.985 0137	490	0.197 2239	0.189 5304	2088	0.085 5572	0.082 2194	827
12	0.986 6012	0.988 1167	453	0.181 8233	0.174 1032	2097	0.078 8758	0.075 5265	837
13	0.989 5600	0.990 9311	416	0.166 3707	0.158 6264	2106	0.072 1718	0.068 8121	847
14	0.992 2299	0.993 4563	378	0.150 8708	0.143 1046	2114	0.065 4476	0.062 0786	857
15	-0.994 6102	-0.995 6916	+ 340	+0.135 3283	+0.127 5425	+2121	+0.058 7052	+0.055 3277	+867
16	0.996 7004	0.997 6366	302	0.119 7478	0.111 9447	2128	0.051 9464	0.048 5615	876
17	0.998 5002	0.999 2910	263	0.104 1339	0.096 3159	2134	0.045 1731	0.041 7818	885
18	1.000 0091	1.000 6543	224	0.088 4913	0.080 6606	2140	0.038 3878	0.034 9910	894
19	1.001 2267	1.001 7262	185	0.072 8243	0.064 9830	2145	0.031 5918	0.028 1905	902
20	-1.002 1529	-1.002 5066	+ 146	+0.057 1372	+0.049 2875	+2149	+0.024 7872	+0.021 3822	+910
21	1.002 7874	1.002 9953	106	0.041 4345	0.033 5786	2153	0.017 9757	0.014 5680	918
22	1.003 1302	1.003 1921	66	0.025 7204	0.017 8604	2156	0.011 1592	0.007 7496	926
23	1.003 1809	1.003 0969	+ 26	+0.009 9991	+0.002 1370	2158	+0.004 3395	+0.000 9290	933
24	1.002 9391	1.002 7084	- 14	-0.005 7252	-0.013 5871	2160	-0.002 4816	-0.005 8920	940
25	-1.002 4046	-1.002 0276	- 54	-0.021 4481	-0.029 3076	+2161	-0.009 3021	-0.012 7116	+947
26	1.001 5774	1.001 0539	95	0.037 1652	0.045 0203	2162	0.016 1203	0.019 5279	954
27	1.000 4572	0.999 7872	136	0.052 8723	0.060 7206	2162	0.022 9343	0.026 3391	960
28	0.999 0438	0.998 2271	177	0.068 5648	0.076 4042	2161	0.029 7422	0.033 1432	966
29	0.997 3370	0.996 3735	218	0.084 2383	0.092 0665	2160	0.036 5420	0.039 9382	972
30	-0.995 3367	-0.994 2265	- 259	-0.099 8883	-0.107 7029	+2158	-0.043 3316	-0.046 7220	+977
Oct. 1	-0.993 0430	-0.991 7862	- 300	-0.115 5099	-0.123 3087	+2155	-0.050 1091	-0.053 4927	+982



FOR GREENWICH MEAN NOON AND MIDNIGHT.

Date.	X		Reduc. to Mean Eq'x of Jan. o.	Y		Reduc. to Mean Eq'x of Jan. o.	Z		Reduc. to Mean Eq'x of Jan. o.
	True Equinox.			True Equinox.			True Equinox.		
	Noon.	Midnight.	Noon.	Noon.	Midnight.	Noon.	Noon.	Midnight.	Noon.
Nov. 16	-0.594 2436	-0.587 2041	-2113	-0.724 9722	-0.729 6580	+1365	-0.314 5021	-0.316 5346	+846
17	0.580 1201	0.572 9920	2146	0.734 2880	0.738 8618	1334	0.318 5429	0.320 5268	835
18	0.565 8205	0.558 6060	2179	0.743 3790	0.747 8394	1302	0.322 4862	0.324 4210	823
19	0.551 3490	0.544 0500	2212	0.752 2426	0.756 5883	1270	0.326 3310	0.328 2161	811
20	0.536 7096	0.529 3283	2244	0.760 8761	0.765 1057	1237	0.330 0762	0.331 9111	799
21	-0.521 9065	-0.514 4448	-2276	-0.769 2769	-0.773 3893	+1204	-0.333 7206	-0.335 5047	+786
22	0.506 9438	0.499 4040	2307	0.777 4426	0.781 4365	1170	0.337 2631	0.338 9958	773
23	0.491 8260	0.484 2102	2338	0.785 3706	0.789 2446	1136	0.340 7026	0.342 3834	760
24	0.476 5573	0.468 8677	2368	0.793 0583	0.796 8113	1101	0.344 0380	0.345 6664	746
25	0.461 1419	0.453 3806	2398	0.800 5034	0.804 1342	1065	0.347 2683	0.348 8436	732
26	-0.445 5843	-0.437 7535	-2427	-0.807 7034	-0.811 2107	+1029	-0.350 3922	-0.351 9139	+717
27	0.429 8888	0.421 9906	2455	0.814 6558	0.818 0384	992	0.353 4087	0.354 8764	702
28	0.414 0597	0.406 0966	2483	0.821 3582	0.824 6149	955	0.356 3169	0.357 7300	687
29	0.398 1019	0.390 0762	2510	0.827 8083	0.830 9380	917	0.359 1156	0.360 4735	672
30	0.382 0200	0.373 9339	2537	0.834 0038	0.837 0054	878	0.361 8037	0.363 1060	657
Dec. 1	-0.365 8186	-0.357 6746	-2563	-0.839 9424	-0.842 8146	+ 839	-0.364 3803	-0.365 6264	+641
2	0.349 5025	0.341 3030	2588	0.845 6218	0.848 3636	799	0.366 8443	0.368 0338	625
3	0.333 0768	0.324 8244	2613	0.851 0397	0.853 6499	759	0.369 1947	0.370 3270	609
4	0.316 5465	0.308 2438	2637	0.856 1939	0.858 6714	719	0.371 4306	0.372 5053	592
5	0.299 9169	0.291 5666	2661	0.861 0823	0.863 4262	678	0.373 5511	0.374 5677	575
6	-0.283 1936	-0.274 7985	-2684	-0.865 7030	-0.867 9124	+ 637	-0.375 5552	-0.376 5134	+557
7	0.266 3820	0.257 9448	2706	0.870 0543	0.872 1285	595	0.377 4423	0.378 3418	539
8	0.249 4877	0.241 0113	2727	0.874 1347	0.876 0728	553	0.379 2118	0.380 0522	521
9	0.232 5163	0.224 0036	2748	0.877 9427	0.879 7442	510	0.380 8630	0.381 6441	503
10	0.215 4737	0.206 9275	2768	0.881 4772	0.883 1416	467	0.382 3955	0.383 1171	485
11	-0.198 3655	-0.189 7885	-2787	-0.884 7372	-0.886 2640	+ 423	-0.383 8089	-0.384 4708	+466
12	0.181 1971	0.172 5921	2805	0.887 7219	0.889 1108	379	0.385 1029	0.385 7050	447
13	0.163 9741	0.155 3438	2823	0.890 4306	0.891 6813	335	0.386 2772	0.386 8195	428
14	0.146 7018	0.138 0489	2840	0.892 8627	0.893 9749	290	0.387 3318	0.387 8141	409
15	0.129 3856	0.120 7127	2856	0.895 0177	0.895 9912	245	0.388 2663	0.388 6884	389
16	-0.112 0307	-0.103 3404	-2872	-0.896 8952	-0.897 7298	+ 199	-0.389 0804	-0.389 4424	+369
17	0.094 6424	0.085 9373	2886	0.898 4948	0.899 1902	153	0.389 7742	0.390 0759	349
18	0.077 2258	0.068 5085	2899	0.899 8161	0.900 3723	107	0.390 3474	0.390 5888	329
19	0.059 7861	0.051 0592	2912	0.900 8589	0.901 2758	60	0.390 7999	0.390 9809	309
20	0.042 3285	0.033 5945	2924	0.901 6229	0.901 9002	+ 13	0.391 1316	0.391 2521	288
21	-0.024 8580	-0.016 1196	-2935	-0.902 1078	-0.902 2456	- 34	-0.391 3423	-0.391 4023	+267
22	-0.007 3799	+0.001 3604	2945	0.902 3136	0.902 3117	82	0.391 4321	0.391 4316	246
23	+0.010 1006	0.018 8402	2954	0.902 2400	0.902 0984	130	0.391 4008	0.391 3396	225
24	0.027 5786	0.036 3151	2962	0.901 8869	0.901 6056	178	0.391 2482	0.391 1265	204
25	0.045 0490	0.053 7797	2969	0.901 2544	0.900 8334	227	0.390 9745	0.390 7922	182
26	+0.062 5065	+0.071 2287	-2976	-0.900 3425	-0.899 7818	- 276	-0.390 5795	-0.390 3366	+160
27	0.079 9457	0.088 6568	2981	0.899 1512	0.898 4508	325	0.390 0633	0.389 7597	138
28	0.097 3615	0.106 0590	2985	0.897 6807	0.896 8407	374	0.389 4258	0.389 0616	116
29	0.114 7487	0.123 4298	2988	0.895 9310	0.894 9515	423	0.388 6671	0.388 2423	94
30	0.132 1018	0.140 7639	2991	0.893 9023	0.892 7834	473	0.387 7872	0.387 3019	72
31	+0.149 4154	+0.158 0557	-2993	-0.891 5948	-0.890 3366	- 523	-0.386 7863	-0.386 2405	+ 49
32	+0.166 6840	+0.175 2997	-2994	-0.889 0088	-0.887 6115	- 573	-0.385 6644	-0.385 0581	+ 27

# 208 MOON'S LONGITUDE AND LATITUDE, 1915.

FOR

MEAN NOON AND 



MOON'S LONGITUDE AND LATITUDE, 1915. 209

FOR GREENWICH MEAN NOON AND MIDNIGHT.

Day of month.	APRIL.		Day of Month.	MAY.		Day of Month.	JUNE.	
	True Long.	Latitude.		True Long.	Latitude.		True Long.	Latitude.
	° ' "	° ' "		° ' "	° ' "		° ' "	° ' "
1.0	208 14 42.7	-4 33 28.9	1.0	247 12 22.5	-4 52 3.0	1.0	300 6 20.6	-1 42 54.3
1.5	215 43 37.6	4 49 31.7	1.5	254 44 54.7	4 39 55.2	1.5	307 8 7.1	1 7 8.0
2.0	223 12 31.5	5 0 36.9	2.0	262 13 3.3	4 23 5.5	2.0	314 2 37.6	-0 30 56.7
2.5	230 40 17.5	5 6 33.2	2.5	269 35 53.5	4 2 1.8	2.5	320 49 59.8	+0 5 5.7
3.0	238 5 53.1	5 7 17.8	3.0	276 52 43.8	3 37 16.4	3.0	327 30 29.8	0 40 28.8
3.5	245 28 23.2	-5 2 55.5	3.5	284 3 6.4	-3 9 24.1	3.5	334 4 30.5	+1 14 45.9
4.0	252 47 1.6	4 53 38.2	4.0	291 6 46.2	2 39 1.0	4.0	340 32 29.8	1 47 33.9
4.5	260 1 12.0	4 39 43.9	4.5	298 3 39.7	2 6 42.9	4.5	346 54 58.9	2 18 32.8
5.0	267 10 27.9	4 21 35.4	5.0	304 53 53.3	1 33 4.3	5.0	353 12 30.8	2 47 25.5
5.5	274 14 32.9	3 59 38.9	5.5	311 37 41.6	0 58 37.9	5.5	359 25 39.6	3 13 57.5
6.0	281 13 19.7	-3 34 23.1	6.0	318 15 25.3	-0 23 54.2	6.0	5 34 59.1	+3 37 56.5
6.5	288 6 48.8	3 6 18.0	6.5	324 47 29.7	+0 10 38.8	6.5	11 41 2.4	3 59 12.1
7.0	294 55 7.0	2 35 54.3	7.0	331 14 22.6	0 44 35.6	7.0	17 44 20.9	4 17 35.5
7.5	301 38 26.4	2 3 42.5	7.5	337 36 33.0	1 17 33.0	7.5	23 45 24.0	4 32 59.2
8.0	308 17 2.6	1 30 12.4	8.0	343 54 32.5	1 49 10.1	8.0	29 44 39.0	4 45 17.2
8.5	314 51 13.7	-0 55 53.2	8.5	350 8 48.6	+2 19 8.0	8.5	35 42 30.8	+4 54 24.9
9.0	321 21 18.8	-0 21 12.7	9.0	356 19 49.6	2 47 9.6	9.0	41 39 22.0	5 0 18.8
9.5	327 47 37.5	+0 13 22.4	9.5	2 28 1.4	3 12 59.6	9.5	47 35 32.5	5 2 56.7
10.0	334 10 28.7	0 47 26.8	10.0	8 33 47.9	3 36 24.4	10.0	53 31 20.1	5 2 17.9
10.5	340 30 10.2	1 20 36.6	10.5	14 37 30.4	3 57 12.0	10.5	59 27 0.5	4 58 23.0
11.0	346 46 58.5	+1 52 29.7	11.0	20 39 27.8	+4 15 12.0	11.0	65 22 47.8	+4 51 14.1
11.5	353 1 8.1	2 22 45.5	11.5	26 39 56.7	4 30 15.5	11.5	71 18 54.8	4 40 55.0
12.0	359 12 51.9	2 51 5.1	12.0	32 39 11.7	4 42 15.4	12.0	77 15 33.0	4 27 31.0
12.5	5 22 21.2	3 17 11.5	12.5	38 37 25.5	4 51 6.1	12.5	83 12 53.7	4 11 9.1
13.0	11 29 45.9	3 40 49.4	13.0	44 34 49.3	4 56 43.7	13.0	89 11 8.1	3 51 57.9
13.5	17 35 14.8	+4 1 45.9	13.5	50 31 33.6	+4 59 6.0	13.5	95 10 27.5	+3 30 7.8
14.0	23 38 56.1	4 19 49.9	14.0	56 27 48.3	4 58 12.5	14.0	101 11 4.2	3 5 50.7
14.5	29 40 57.7	4 34 52.3	14.5	62 23 43.3	4 54 4.4	14.5	107 13 11.8	2 39 20.1
15.0	35 41 27.9	4 46 46.1	15.0	68 19 29.2	4 46 44.6	15.0	113 17 5.3	2 10 51.0
15.5	41 40 35.7	4 55 26.5	15.5	74 15 17.7	4 36 17.5	15.5	119 23 1.5	1 40 39.8
16.0	47 38 31.4	+5 0 50.3	16.0	80 11 21.7	+4 22 49.1	16.0	125 31 19.0	+1 9 4.4
16.5	53 35 26.9	5 2 56.2	16.5	86 7 56.2	4 6 26.7	16.5	131 42 18.5	0 36 24.0
17.0	59 31 36.0	5 1 44.6	17.0	92 5 18.4	3 47 19.1	17.0	137 56 22.5	+0 2 59.1
17.5	65 27 15.0	4 57 17.4	17.5	98 3 48.0	3 25 36.4	17.5	144 13 55.2	-0 30 48.4
18.0	71 22 42.7	4 49 37.8	18.0	104 3 47.3	3 1 29.7	18.0	150 35 22.1	1 4 35.5
18.5	77 18 20.8	+4 38 50.2	18.5	110 5 41.1	+2 35 11.5	18.5	157 1 9.3	-1 37 57.7
19.0	83 14 33.6	4 25 0.3	19.0	116 9 57.1	2 6 55.5	19.0	163 31 42.7	2 10 29.1
19.5	89 11 48.2	4 8 14.8	19.5	122 17 5.2	1 36 56.7	19.5	170 7 27.3	2 41 42.8
20.0	95 10 34.4	3 48 41.2	20.0	128 27 37.5	1 5 31.6	20.0	176 48 45.7	3 11 10.8
20.5	101 11 24.5	3 26 28.1	20.5	134 42 7.6	+0 32 58.0	20.5	183 35 57.2	3 38 23.8
21.0	107 14 52.9	+3 1 45.4	21.0	141 1 9.9	-0 0 24.4	21.0	190 29 15.9	-4 2 52.2
21.5	113 21 35.7	2 34 44.3	21.5	147 25 18.9	0 34 13.8	21.5	197 28 49.1	4 24 6.4
22.0	119 32 9.9	2 5 37.4	22.0	153 55 8.0	1 8 6.6	22.0	204 34 36.2	4 41 37.4
22.5	125 47 12.9	1 34 39.2	22.5	160 31 8.2	1 41 36.9	22.5	211 46 26.8	4 54 58.2
23.0	132 7 22.0	1 2 6.3	23.0	167 13 46.6	2 14 16.1	23.0	219 3 59.9	5 3 44.6
23.5	138 33 12.7	+0 28 17.6	23.5	174 3 25.0	-2 45 33.5	23.5	226 26 42.7	-5 7 36.8
24.0	145 5 17.7	-0 6 24.9	24.0	181 0 17.4	3 14 56.5	24.0	233 53 51.0	5 6 20.7
24.5	151 44 5.4	0 41 36.2	24.5	188 4 28.4	3 41 50.9	24.5	241 24 29.7	4 59 49.3
25.0	158 29 58.2	1 16 48.2	25.0	195 15 51.3	4 5 42.0	25.0	248 57 34.5	4 48 3.6
25.5	165 23 11.1	1 51 29.2	25.5	202 34 6.7	4 25 55.4	25.5	256 31 54.0	4 31 13.2
26.0	172 23 49.5	-2 25 4.6	26.0	209 58 40.9	-4 41 59.0	26.0	264 6 12.7	-4 9 36.6
26.5	179 31 47.2	2 56 57.1	26.5	217 28 46.5	4 53 24.4	26.5	271 39 14.3	3 43 40.4
27.0	186 46 45.4	3 26 27.9	27.0	225 3 22.5	4 59 48.8	27.0	279 9 45.0	3 13 58.3
27.5	194 8 12.1	3 52 58.1	27.5	232 41 15.8	5 0 56.5	27.5	286 36 36.9	2 41 9.3
28.0	201 35 21.2	4 15 50.0	28.0	240 21 4.6	4 56 40.6	28.0	293 58 50.1	2 5 55.8
28.5	209 7 13.6	-4 34 29.2	28.5	248 1 21.8	-4 47 3.8	28.5	301 15 34.9	-1 29 1.7
29.0	216 42 38.6	4 48 26.4	29.0	255 40 39.0	4 32 18.4	29.0	308 26 12.8	0 51 10.6
29.5	224 20 16.9	4 57 19.4	29.5	263 17 30.9	4 12 45.5	29.5	315 30 17.1	-0 13 4.0
30.0	231 58 43.8	5 0 54.5	30.0	270 50 38.9	3 48 54.1	30.0	322 27 32.6	+0 24 39.8
30.5	239 36 33.4	4 59 7.4	30.5	278 18 54.8	3 21 19.3	30.5	329 17 54.5	1 1 26.6
31.0	247 12 22.5	-4 52 3.0	31.0	285 41 22.8	-2 50 40.3	31.0	336 1 27.5	+1 36 46.5
31.5	254 44 54.7	-4 39 55.2	31.5	292 57 20.8	-2 17 38.3	31.5	342 38 24.5	+2 10 14.1



# 210 MOON'S LONGITUDE AND LATITUDE, 1915.

FOR

MEAN NOON AND MIDNIGHT.



# MOON'S LONGITUDE AND LATITUDE, 1915. 211

FOR

MEAN NOON AND MIDNIGHT.

~~1915-1916~~

~~1915~~

212 MOON'S EQUATOR, LONGITUDE, ETC., 1915.

 MEAN NOON.

ANTITIES REQUIRED IN COMPUTING  
THE MOON'S LIBRATION.

SUN'S ABERRATION AND HORI-  
ZONTAL PARALLAX.

ARGUMENT, ( $\Omega - \lambda$ ), or ( $\Omega - \lambda - 180^\circ$ ).					FOR GREENWICH MEAN NOON.		
$-\lambda$	$\mu$	$\frac{1}{A}$	$B$	$\Omega - \lambda$	Date.	Aberration.	Hor. Par.
•	'		• '	•	1915.	"	"
0	0.0	37	0 0.0	180	Jan. 0	−20.81	8.95
2	0.0	37	0 3.2	178	10	20.81	8.95
4	0.1	37	0 6.4	176	20	20.80	8.94
6	0.1	38	0 9.6	174	30	20.77	8.93
8	0.2	38	0 12.8	172	Feb. 9	20.74	8.92
10	0.2	38	0 16.0	170	19	−20.70	8.90
12	0.3	38	0 19.2	168	Mar. 1	20.65	8.88
14	0.3	38	0 22.3	166	11	20.60	8.86
16	0.3	39	0 25.4	164	21	20.54	8.83
18	0.4	39	0 28.5	162	31	20.48	8.81
20	0.4	40	0 31.5	160	Apr. 10	−20.42	8.78
22	0.4	40	0 34.5	158	20	20.36	8.76
24	0.5	41	0 37.5	156	30	20.31	8.73
26	0.5	42	0 40.4	154	May 10	20.26	8.71
28	0.5	42	0 43.2	152	20	20.22	8.69
30	0.5	43	0 46.1	150	30	−20.18	8.68
32	0.6	44	0 48.8	148	June 9	20.16	8.67
34	0.6	45	0 51.5	146	19	20.14	8.66
36	0.6	46	0 54.1	144	29	20.13	8.66
38	0.6	47	0 56.7	142	July 9	20.13	8.66
40	0.6	49	0 59.2	140	19	−20.14	8.66
42	0.6	50	1 1.6	138	29	20.16	8.67
44	0.6	52	1 4.0	136	Aug. 8	20.18	8.68
46	0.6	54	1 6.3	134	18	20.22	8.69
48	0.6	56	1 8.5	132	28	20.26	8.71
50	0.6	58	1 10.6	130	Sept. 7	−20.31	8.73
52	0.6	61	1 12.6	128	17	20.36	8.76
54	0.6	64	1 14.5	126	27	20.42	8.78
56	0.6	67	1 16.4	124	Oct. 7	20.48	8.81
58	0.6	70	1 18.1	122	17	20.54	8.83
60	0.5	75	1 19.8	120	27	−20.59	8.86
62	0.5	80	1 21.3	118	Nov. 6	20.65	8.88
64	0.5	85	1 22.8	116	16	20.70	8.90
66	0.5	92	1 24.1	114	26	20.74	8.92
68	0.4	100	1 25.4	112	Dec. 6	20.77	8.93
70	0.4	109	1 26.5	110	16	−20.79	8.94
72	0.4	121	1 27.6	108	26	20.81	8.95
74	0.3	135	1 28.5	106	36	−20.81	8.95
76	0.3	154	1 29.4	104			
78	0.3	180	1 30.1	102			
80	0.2	215	1 30.7	100			
82	0.2	268	1 31.2	98			
84	0.1	357	1 31.6	96			
86	0.1	535	1 31.9	94			
88	0.0	1070	1 32.0	92			
90	0.0	∞	1 32.1	90			

$\mu$  has the sign of  $\tan (\lambda - \Omega)$   
 $A$  has the sign of  $\cos (\Omega - \lambda)$   
 $B$  has the sign of  $\sin (\Omega - \lambda)$   
 See formulæ, page xi.

[Eph 15]

Sun's Mean Equatorial Horizontal  
Parallax.

8''.80; log=0.94448.

(CONSTANTS OF PARIS CONFERENCE.)

FOR GREENWICH MEAN NOON.

Date.	Preces- sion in Longi- tude from 1915.0.	Nutation.			Obliquity of Ecliptic. (Newcomb.)	Date.	Preces- sion in Longi- tude from 1915.0.	Nutation.			Ol E (N)
		$\delta' \phi$ In Longi- tude.	$\delta' a$ In R. A.	$\delta' \omega$ In Obliqui- ty.				$\delta' \phi$ In Longi- tude.	$\delta' a$ In R. A.	$\delta' \omega$ In Obliqui- ty.	
	"	"	s	"	23° 27'		"	"	s	"	
Jan. 0	- 0.13	+ 9.07	+0.554	+7.33	8.56	July 4	+25.32	+11.51	+0.704	+6.48	
5	+ 0.56	9.35	0.572	7.35	8.57	9	26.01	11.75	0.719	6.50	
10	1.25	9.62	0.588	7.38	8.60	14	26.70	11.96	0.732	6.52	
15	1.94	9.86	0.603	7.43	8.64	19	27.39	12.15	0.743	6.56	
20	2.62	10.07	0.616	7.48	8.69	24	28.08	12.32	0.753	6.60	
25	+ 3.31	+10.25	+0.627	+7.54	8.74	29	+28.76	+12.45	+0.762	+6.65	
30	4.00	10.40	0.636	7.62	8.81	Aug. 3	29.45	12.55	0.768	6.71	
Feb. 4	4.69	10.49	0.642	7.70	8.88	8	30.14	12.62	0.772	6.78	
9	5.38	10.55	0.645	7.77	8.95	13	30.83	12.65	0.774	6.84	
14	6.06	10.57	0.646	7.84	9.01	18	31.52	12.65	0.774	6.90	
19	+ 6.75	+10.55	+0.645	+7.91	9.07	23	+32.20	+12.62	+0.772	+6.96	
24	7.44	10.50	0.642	7.97	9.13	28	32.89	12.56	0.768	7.01	
Mar. 1	8.13	10.41	0.637	8.02	9.17	Sept. 2	33.58	12.46	0.762	7.04	
6	8.82	10.30	0.630	8.04	9.19	7	34.27	12.35	0.755	7.07	
11	9.50	10.17	0.622	8.06	9.21	12	34.95	12.22	0.747	7.08	
16	+10.19	+10.04	+0.613	+8.06	9.19	17	+35.64	+12.07	+0.738	+7.08	
21	10.88	9.88	0.604	8.05	9.17	22	36.33	11.90	0.729	7.06	
26	11.57	9.72	0.595	8.02	9.14	27	37.02	11.75	0.719	7.03	
31	12.25	9.58	0.586	7.98	9.10	Oct. 2	37.71	11.59	0.709	6.98	
Apr. 5	12.94	9.45	0.578	7.91	9.02	7	38.39	11.44	0.700	6.92	
10	+13.63	+ 9.34	+0.571	+7.84	8.94	12	+39.08	+11.31	+0.692	+6.84	
15	14.32	9.24	0.566	7.74	8.84	17	39.77	11.21	0.686	6.75	
20	15.01	9.18	0.562	7.65	8.74	22	40.46	11.12	0.681	6.64	
25	15.69	9.14	0.560	7.54	8.62	27	41.15	11.08	0.678	6.53	
30	16.38	9.14	0.559	7.43	8.50	Nov. 1	41.83	11.06	0.677	6.41	
May 5	+17.07	+ 9.17	+0.561	+7.31	8.38	6	+42.52	+11.09	+0.678	+6.28	
10	17.76	9.24	0.565	7.19	8.26	11	43.21	11.15	0.682	6.16	
15	18.45	9.34	0.571	7.08	8.13	16	43.90	11.26	0.689	6.03	
20	19.13	9.47	0.579	6.97	8.02	21	44.58	11.40	0.698	5.91	
25	19.82	9.63	0.589	6.87	7.91	26	45.27	11.59	0.709	5.80	
30	+20.51	+ 9.82	+0.601	+6.78	7.82	Dec. 1	+45.96	+11.79	+0.722	+5.69	
June 4	21.20	10.03	0.614	6.69	7.72	6	46.65	12.03	0.736	5.60	
9	21.88	10.26	0.628	6.63	7.65	11	47.34	12.29	0.752	5.52	
14	22.57	10.50	0.643	6.57	7.59	16	48.02	12.57	0.769	5.46	
19	23.26	10.76	0.658	6.52	7.53	21	48.71	12.86	0.786	5.41	
24	+23.95	+11.02	+0.673	+6.49	7.49	26	+49.40	+13.15	+0.804	+5.39	
29	24.64	11.27	0.689	6.48	7.48	31	50.09	13.43	0.822	5.38	
July 4	+25.32	+11.51	+0.704	+6.48	7.47	36	+50.77	+13.71	+0.839	+5.39	

Precession for 1915.0 . . 50.2597 log=1.701220

Precession in a Solar day . 0.13761 log=9.13865

Precession in a Sidereal day 0.13723 log=9.13745

The short period terms of the Nutation are given

for Washington midnight on pp. 231-232.

Mean Obliquity, 1915.0. . . . .

Newcomb . . . . . 23 2

Hansen . . . . . 23 2

Le Verrier . . . . . 23 2

Peters . . . . . 23 2

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## PART II.

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### ASTRONOMICAL EPHEMERIS FOR THE MERIDIAN OF WASHINGTON.

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The constants of precession, nutation and aberration adopted by the *Conférence Internationale des Étoiles Fondamentales* which met in Paris in May, 1896, are given on page xiv, and together with the notation of BESSEL are used in the formulæ which follow.

BESSELIAN STAR-NUMBERS.

<i>Terms of Long Period.</i>	<i>Terms of Short Period.</i>
$A = \tau - 0.342\ 20 \sin \Omega$	$-0.004\ 05 \sin 2 \mathfrak{C}$
$\quad + 0.004\ 15 \sin 2 \Omega$	$+0.000\ 23 \sin (\mathfrak{C} + \Gamma')$
$\quad - 0.025\ 26 \sin 2 L$	$+0.001\ 34 \sin (\mathfrak{C} - \Gamma')$
$\quad + 0.002\ 51 \sin (L - \Gamma)$	$-0.000\ 68 \sin (2 \mathfrak{C} - \Omega)$
$\quad - 0.000\ 99 \sin (3 L - \Gamma)$	$-0.000\ 52 \sin (3 \mathfrak{C} - \Gamma')$
$\quad + 0.000\ 42 \sin (L + \Gamma)$	$+0.000\ 30 \sin (\mathfrak{C} - 2 L + \Gamma')$
$\quad + 0.000\ 25 \sin (2 L - \Omega)$	$+0.000\ 12 \sin 2 (\mathfrak{C} - L)$
"	"
$B = - 9.210 \cos \Omega$	$-0.088 \cos 2 \mathfrak{C}$
$\quad + 0.090 \cos 2 \Omega$	$-0.018 \cos (2 \mathfrak{C} - \Omega)$
$\quad - 0.552 \cos 2 L$	$-0.011 \cos (3 \mathfrak{C} - \Gamma')$
$\quad - 0.022 \cos (3 L - \Gamma)$	$+0.005 \cos (\mathfrak{C} + \Gamma')$
$\quad + 0.009 \cos (L + \Gamma)$	
$\quad + 0.007 \cos (2 L - \Omega)$	
$C = -20.4700 \cos \omega \cos \odot$	
$D = -20.4700 \sin \odot$	
$E = - 0.0417 \sin \Omega + 0''.0005 \sin 2 \Omega - 0''.0031 \sin 2 L$	

BESSEL'S Star-Constants.

$a = 3^s.072\ 62 + 1^s.336\ 38 \sin \alpha_0 \tan \delta_0$	$a' = 20''.0455 \cos \alpha_0$
$b = \frac{1}{15} \cos \alpha_0 \tan \delta_0$	$b' = -\sin \alpha_0$
$c = \frac{1}{15} \cos \alpha_0 \sec \delta_0$	$c' = \tan \omega \cos \delta_0 - \sin \alpha_0 \sin \delta_0$
$d = \frac{1}{15} \sin \alpha_0 \sec \delta_0$	$d' = \cos \alpha_0 \sin \delta_0$

Formulæ for Reduction to Apparent Position.

\*  $\alpha = \alpha_0 + \tau \mu + Aa + Bb + Cc + Dd + \frac{1}{15} E$       (in time)  
 $\delta = \delta_0 + \tau \mu' + Aa' + Bb' + Cc' + Dd'$       (in arc)

INDEPENDENT STAR-NUMBERS.

$f + f' = +46''.0892 A + E$  (in arc)  $= 3^s.072\ 62 A + \frac{1}{15} E$       (in time)  
 $f' = - 0^s.0124 \sin 2 \mathfrak{C} + 0^s.0041 \sin (\mathfrak{C} - \Gamma') + 0^s.0007 \sin (\mathfrak{C} + \Gamma')$   
 $\quad - 0^s.0021 \sin (2 \mathfrak{C} - \Omega) - 0^s.0016 \sin (3 \mathfrak{C} - \Gamma')$   
 $\quad + 0^s.0009 \sin (\mathfrak{C} - 2 L + \Gamma') + 0^s.0004 \sin 2 (\mathfrak{C} - L)$   
 $g \sin G = B$        $h \sin H = C$        $i = C \tan \omega$   
 $g \cos G = 20''.0455 A$        $h \cos H = D$

Formulæ for Reduction to Apparent Position.

\*  $\alpha = \alpha_0 + f + f' + \tau \mu + \frac{1}{15} g \sin (G + \alpha_0) \tan \delta_0 + \frac{1}{15} h \sin (H + \alpha_0) \sec \delta_0$       (in time)  
 $\delta = \delta_0 + \tau \mu' + g \cos (G + \alpha_0) + h \cos (H + \alpha_0) \sin \delta_0 + i \cos \delta_0$       (in arc)

In the above formulæ,  
 $\tau$  denotes the time reckoned in units of one year, from the beginning of the  
Besselian fictitious year (1915, January 0<sup>d</sup>.732, Washington mean time),  
 $\alpha_0, \delta_0,$  the star's mean R. A. and Decl. at the beginning of the fictitious year,  
 $\alpha, \delta,$  the star's apparent right ascension and declination at the time  $\tau$ ,  
 $\mu, \mu',$  the annual proper motion in right ascension and declination,

$\odot$ , the Sun's true longitude,	$\omega$ , the obliquity of the ecliptic,
$L$ , the Sun's mean longitude,	$\Gamma$ , the long. of the Sun's perigee,
$\Omega$ , the longitude of the Moon's ascending node,	$\Gamma'$ , the long. of the Moon's perigee,
	$\mathfrak{C}$ , the Moon's mean longitude.

\* See page 217 for statement concerning the use of these formulæ.  
[Eph 15]

The independent star-numbers are more convenient than BESSEL's, when only one or two apparent positions of a star are required, or when BESSEL's star-constants are not known with sufficient accuracy.

In using the star-constants of the *British Association Catalogue*,  $a, b, c, d, a', b', c', d'$ , with the star-numbers of this Ephemeris, the quantities to be computed are  $Ac, Bd, Ca, Db, -Ac', -Bd', -Ca', -Db'$ .

In the computation of the independent star-numbers given for Washington mean midnight of each day of the year, on pages 222-229, the short-period terms—that is, the terms involving the Moon's mean longitude—have been included in the two columns headed  $G$  and  $\text{Log } g$ . The quantities  $f$  and  $f'$  correspond to  $f'$  and  $f''$ , respectively, as given on the page of constants in Part IV of the American Ephemeris for the years 1901 to 1911, inclusive, and are tabulated in the third and fourth columns, respectively, giving separately the effect of the long-period and short-period terms.  $f'$  differs but slightly from the term  $-0''.1866 \sin 2\zeta + 0''.0622 \sin (\zeta - \Gamma)$  given on page 37 of the *Procès-Verbaux* of the Paris Conference, and also on page 289 of the American Ephemeris and Nautical Almanac for 1900. In computing the reduction of stars from mean to apparent place, or vice versa, using the independent star-numbers, the quantity  $f'$  (which is the same for all stars) should be omitted in using the formulæ for  $\alpha$  on page 216, in case it is desired to make the reduction in conformity with the decision of the Paris Conference with reference to this matter. See page of *Procès-Verbaux* above cited.

In the computation of the Besselian star-numbers, pages 218-221, all short-period terms have been included, and hence in using these quantities in the reduction of stars to apparent place by means of the formulæ for that purpose on page 216,  $f'$  must be subtracted from the final result if it is desired, in compliance with the decision of the Paris Conference, to omit that quantity.

In computing the ephemerides of the circumpolar stars in this volume, all short-period terms have been included, excepting the quantity  $f'$  above mentioned, which has been omitted.

In the computation of the ephemerides of the ten-day stars, no short-period terms have been included. These terms attain two maxima and two minima during the tropical month. At maximum and minimum they may amount in right ascension to  $\pm 0''.008 \tan \delta$ , and in declination to  $\pm 0''.13$ . For computing the effect of these terms for the correction of the positions of stars interpolated from the ten-day ephemerides, the following formulæ may be used, in which  $\Delta\alpha$  and  $\Delta\delta$  denote the effect of the short-period terms in right ascension and declination, respectively, and  $\delta''\psi$  and  $\delta''\omega$ , the sum of the short-period terms of the nutation in longitude and obliquity:

$$\begin{aligned}\Delta\alpha &= D'_\psi \alpha \delta''\psi + D_\omega \alpha \delta''\omega \\ \Delta\delta &= D'_\psi \delta \delta''\psi + D_\omega \delta \delta''\omega\end{aligned}$$

The values of  $\delta''\psi$  and of  $\delta''\omega$  for Washington mean midnight are given for each day of the year on pages 231-232, and have been computed as follows:

$$\delta''\psi = 50''.37 A, \quad \delta''\omega = -B,$$

in which  $A$ , and  $B$ , are the sums of the short-period terms given in the expressions for  $A$  and  $B$  on page 216.

The quantities  $D'_\psi \alpha$ ,  $D_\omega \alpha$ ,  $D'_\psi \delta$ , and  $D_\omega \delta$  are given for each ten-day star on pages 287-486, and have been computed by means of the following formulæ:

$$\begin{aligned}D'_\psi \alpha &= \frac{1}{18} \sin \alpha \tan \delta \sin \omega & D_\omega \alpha &= -\frac{1}{18} \cos \alpha \tan \delta \\ D'_\psi \delta &= \cos \alpha \sin \omega & D_\omega \delta &= \sin \alpha\end{aligned}$$

The complete derivative of the right ascension with reference to  $\psi$  is

$$D_\psi \alpha = \frac{1}{18} (\cos \omega + \sin \alpha \tan \delta \sin \omega)$$

and the omission of the term  $\frac{1}{18} \cos \omega$  is made in accordance with the above-mentioned decision of the Paris Conference with reference to the quantity  $f'$ .



FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sid. Hr.)		Log A.	Log B.	Log C.	Log D.	Solar Day. (Sid. Hr.)		Log A.	Log B.	Log C.
Jan. 0		+9.25629	-0.8594	-0.50104	+1.30484	Feb. 15		+9.52795	-0.9012	-1.19460
1		9.26940	0.8608	0.54388	1.30345	16		9.52862	0.9019	1.19958
2		9.28096	0.8632	0.58276	1.30191	17		9.52953	0.9015	1.20436
3		9.29041	0.8662	0.61831	1.30023	18		9.53104	0.9004	1.20896
h		9.29758	0.8692	0.65104	1.29841	19	h	9.53335	0.8989	1.21337
(7.0) 5		+9.30272	-0.8716	-0.68135	+1.29644	(10.0) 20		+9.53653	-0.8973	-1.21761
6		9.30651	0.8728	0.70956	1.29432	21		9.54050	0.8961	1.22167
7		9.30999	0.8726	0.73591	1.29206	22		9.54512	0.8954	1.22555
8		9.31440	0.8711	0.76063	1.28964	23		9.55015	0.8956	1.22927
9		9.32069	0.8687	0.78390	1.28708	24		9.55521	0.8968	1.23282
10		+9.32927	-0.8660	-0.80583	+1.28436	25		+9.55991	-0.8988	-1.23620
11		9.33991	0.8639	0.82659	1.28148	26		9.56380	0.9016	1.23943
12		9.35182	0.8629	0.84627	1.27845	27		9.56672	0.9046	1.24250
13		9.36391	0.8635	0.86496	1.27525	28		9.56853	0.9074	1.24541
14		9.37501	0.8656	0.88275	1.27190	Mar. 1		9.56939	0.9093	1.24817
15		+9.38430	-0.8687	-0.89970	+1.26838	2		+9.56974	-0.9101	-1.25078
16		9.39144	0.8723	0.91589	1.26469	3		9.57015	0.9095	1.25324
17		9.39653	0.8756	0.93135	1.26084	4		9.57122	0.9078	1.25555
18		9.40005	0.8781	0.94615	1.25681	5		9.57344	0.9053	1.25772
19		9.40266	0.8796	0.96032	1.25261	h		9.57699	0.9028	1.25974
h		+9.40504	-0.8798	-0.97392	+1.24823	(11.0) 7		+9.58164	-0.9009	-1.26162
(8.0) 21		9.40783	0.8793	0.98696	1.24366	8		9.58694	0.9002	1.26337
22		9.41150	0.8780	0.99948	1.23891	9		9.59217	0.9009	1.26497
23		9.41627	0.8764	1.01152	1.23398	10		9.59679	0.9028	1.26643
24		9.42215	0.8749	1.02310	1.22884	11		9.60029	0.9054	1.26776
25		+9.42901	-0.8739	-1.03424	+1.22351	12		+9.60257	-0.9082	-1.26895
26		9.43659	0.8736	1.04496	1.21798	13		9.60370	0.9104	1.27000
27		9.44444	0.8743	1.05529	1.21224	14		9.60404	0.9118	1.27092
28		9.45211	0.8761	1.06525	1.20628	15		9.60408	0.9121	1.27171
29		9.45909	0.8788	1.07484	1.20011	16		9.60419	0.9113	1.27237
30		+9.46488	-0.8822	-1.08409	+1.19371	17		+9.60473	-0.9096	-1.27289
31		9.46922	0.8857	1.09301	1.18708	18		9.60599	0.9074	1.27328
Feb. 1		9.47214	0.8888	1.10162	1.18021	19		9.60801	0.9050	1.27354
2		9.47395	0.8909	1.10992	1.17309	20		9.61076	0.9028	1.27367
3		9.47529	0.8917	1.11793	1.16572	h		9.61413	0.9011	1.27366
h		+9.47697	-0.8911	-1.12566	+1.15808	(12.0) 22		+9.61791	-0.9001	-1.27353
(9.0) 5		9.47969	0.8895	1.13312	1.15017	23		9.62183	0.9001	1.27327
6		9.48391	0.8873	1.14032	1.14197	24		9.62556	0.9009	1.27287
7		9.48972	0.8854	1.14727	1.13349	25		9.62885	0.9026	1.27235
8		9.49673	0.8844	1.15397	1.12469	26		9.63134	0.9046	1.27170
9		+9.50423	-0.8848	-1.16043	+1.11558	27		+9.63297	-0.9065	-1.27092
10		9.51135	0.8866	1.16667	1.10614	28		9.63377	0.9079	1.27000
11		9.51739	0.8895	1.17268	1.09635	29		9.63400	0.9081	1.26896
12		9.52199	0.8931	1.17847	1.08621	30		9.63421	0.9070	1.26778
13		9.52509	0.8965	1.18405	1.07569	31		9.63487	0.9047	1.26648
14		+9.52691	-0.8993	-1.18943	+1.06477	Apr. 1		+9.63644	-0.9014	-1.26504
15		+9.52795	-0.9012	-1.19460	+1.05343	2		+9.63917	-0.8979	-1.26346

E = +0''.02 = +0<sup>s</sup>.002  
[Eph 15]

FOR WASHINGTON MEAN MIDNIGHT.

Day. Hr.)	Log A.	Log B.	Log C.	Log D.	Solar Day. (Sid. Hr.)	Log A.	Log B.	Log C.	Log D.
1	+9.63644	-0.9014	-1.26504	-0.60679	May 17	+9.74970	-0.8411	-1.01905	-1.23069
2	9.63917	0.8979	1.26346	0.64231	18	9.75318	0.8415	1.00794	1.23549
3	9.64296	0.8947	1.26176	0.67500	19	9.75618	0.8427	0.99643	1.24011
4	9.64744	0.8926	1.25992	0.70526	20	9.75858	0.8442	0.98448	1.24456
5	9.65216	0.8919	1.25794	0.73343	h 21	9.76038	0.8454	0.97207	1.24884
h 6	+9.65644	-0.8924	-1.25583	-0.75974	(16.0) 22	+9.76163	-0.8458	-0.95918	-1.25296
1.0) 7	9.65993	0.8940	1.25358	0.78441	23	9.76265	0.8449	0.94577	1.25692
8	9.66233	0.8959	1.25118	0.80764	24	9.76374	0.8426	0.93182	1.26072
9	9.66368	0.8975	1.24865	0.82954	25	9.76535	0.8390	0.91728	1.26436
10	9.66428	0.8984	1.24598	0.85026	26	9.76777	0.8345	0.90212	1.26785
11	+9.66445	-0.8981	-1.24317	-0.86991	27	+9.77106	-0.8301	-0.88629	-1.27119
12	9.66467	0.8966	1.24021	0.88857	28	9.77511	0.8263	0.86974	1.27438
13	9.66520	0.8942	1.23710	0.90634	29	9.77960	0.8241	0.85242	1.27743
14	9.66632	0.8911	1.23384	0.92327	30	9.78409	0.8236	0.83426	1.28034
15	9.66817	0.8878	1.23044	0.93944	31	9.78816	0.8246	0.81518	1.28310
16	+9.67066	-0.8845	-1.22688	-0.95489	June 1	+9.79148	-0.8266	-0.79510	-1.28573
17	9.67373	0.8816	1.22316	0.96969	2	9.79399	0.8288	0.77392	1.28821
18	9.67728	0.8796	1.21929	0.98386	3	9.79574	0.8304	0.75154	1.29057
19	9.68097	0.8784	1.21526	0.99746	4	9.79696	0.8311	0.72781	1.29279
20	9.68462	0.8782	1.21107	1.01051	h 5	9.79795	0.8304	0.70259	1.29488
h 21	+9.68793	-0.8788	-1.20671	-1.02306	(17.0) 6	+9.79904	-0.8284	-0.67569	-1.29683
1.0) 22	9.69066	0.8801	1.20218	1.03512	7	9.80045	0.8255	0.64689	1.29866
23	9.69263	0.8815	1.19748	1.04672	8	9.80233	0.8220	0.61592	1.30036
24	9.69392	0.8824	1.19261	1.05790	9	9.80474	0.8185	0.58245	1.30193
25	9.69467	0.8824	1.18756	1.06866	10	9.80759	0.8153	0.54606	1.30337
26	+9.69529	-0.8810	-1.18232	-1.07904	11	+9.81083	-0.8129	-0.50621	-1.30469
27	9.69614	0.8782	1.17690	1.08905	12	9.81430	0.8115	0.46220	1.30588
28	9.69772	0.8744	1.17128	1.09870	13	9.81778	0.8113	0.41311	1.30695
29	9.70029	0.8700	1.16547	1.10802	14	9.82113	0.8122	0.35762	1.30790
30	9.70386	0.8658	1.15945	1.11701	15	9.82412	0.8140	0.29387	1.30872
lay 1	+9.70821	-0.8626	-1.15323	-1.12570	16	+9.82659	-0.8164	-0.21900	-1.30943
2	9.71288	0.8607	1.14679	1.13409	17	9.82851	0.8187	0.12834	1.31001
3	9.71736	0.8603	1.14013	1.14220	18	9.82994	0.8203	0.01351	1.31046
4	9.72127	0.8612	1.13325	1.15003	19	9.83100	0.8207	9.85681	1.31080
5	9.72423	0.8628	1.12613	1.15760	20	9.83207	0.8197	9.60912	1.31102
h 6	+9.72626	-0.8643	-1.11877	-1.16491	h 21	+9.83341	-0.8171	-8.97280	-1.31111
1.0) 7	9.72750	0.8651	1.11116	1.17198	(18.0) 22	9.83535	0.8136	+9.33976	1.31109
8	9.72828	0.8648	1.10329	1.17881	23	9.83805	0.8098	9.72521	1.31095
9	9.72893	0.8633	1.09516	1.18541	24	9.84144	0.8066	9.92604	1.31068
10	9.72981	0.8607	1.08674	1.19179	25	9.84532	0.8046	0.06273	1.31030
11	+9.73117	-0.8572	-1.07804	-1.19795	26	+9.84934	-0.8045	+0.16645	-1.30979
12	9.73312	0.8533	1.06904	1.20390	27	9.85312	0.8061	0.25000	1.30916
13	9.73570	0.8495	1.05972	1.20964	28	9.85636	0.8089	0.31994	1.30842
14	9.73879	0.8460	1.05008	1.21519	29	9.85885	0.8122	0.38005	1.30755
15	9.74230	0.8434	1.04010	1.22054	30	9.86068	0.8153	0.43274	1.30655
16	+9.74601	-0.8417	-1.02976	-1.22571	July 1	+9.86196	-0.8173	+0.47963	-1.30544
17	+9.74970	-0.8411	-1.01905	-1.23069	2	+9.86292	-0.8181	+0.52183	-1.30420

$E = +0''.02 = +0''.002$   
[Eph 13]

FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sid. Hr.)	Log A.	Log B.	Log C.	Log D.	Solar Day. (Sid. Hr.)	Log A.	Log B.	Log C.	Log D.
July 1	+9.86196	-0.8173	+0.47963	-1.30544	Aug. 16	+9.93928	-0.8373	+1.17729	-1.08834
2	9.86292	0.8181	0.52183	1.30420	17	9.94098	0.8349	1.18265	1.07842
3	9.86385	0.8175	0.56018	1.30284	18	9.94320	0.8332	1.18782	1.06813
4	9.86500	0.8157	0.59531	1.30135	19	9.94570	0.8329	1.19281	1.05746
5	9.86650	0.8133	0.62770	1.29974	20	9.94828	0.8342	1.19762	1.04640
h 6	+9.86847	-0.8107	+0.65774	-1.29800	h 21	+9.95057	-0.8369	+1.20226	-1.03492
(19.0) 7	9.87080	0.8083	0.68572	1.29613	(22.0) 22	9.95237	0.8406	1.20673	1.02300
8	9.87348	0.8067	0.71189	1.29414	23	9.95359	0.8444	1.21104	1.01061
9	9.87637	0.8060	0.73647	1.29201	24	9.95432	0.8477	1.21518	0.99772
10	9.87934	0.8064	0.75961	1.28975	25	9.95466	0.8498	1.21917	0.98431
11	+9.88220	-0.8081	+0.78147	-1.28736	26	+9.95484	-0.8505	+1.22300	-0.97033
12	9.88483	0.8107	0.80217	1.28483	27	9.95508	0.8500	1.22667	0.95576
13	9.88703	0.8139	0.82182	1.28217	28	9.95555	0.8485	1.23019	0.94054
14	9.88875	0.8173	0.84050	1.27937	29	9.95634	0.8464	1.23357	0.92463
15	9.88999	0.8201	0.85830	1.27643	30	9.95748	0.8444	1.23679	0.90799
16	+9.89088	-0.8219	+0.87528	-1.27335	31	+9.95892	-0.8427	+1.23988	-0.89054
17	9.89162	0.8222	0.89150	1.27012	Sept. 1	9.96059	0.8418	1.24282	0.87222
18	9.89247	0.8212	0.90703	1.26675	2	9.96238	0.8417	1.24561	0.85295
19	9.89375	0.8189	0.92190	1.26324	3	9.96418	0.8427	1.24827	0.83265
20	9.89565	0.8160	0.93617	1.25957	4	9.96584	0.8446	1.25079	0.81121
h 21	+9.89818	-0.8134	+0.94986	-1.25574	h 5	+9.96728	-0.8472	+1.25317	-0.78851
(20.0) 22	9.90120	0.8120	0.96302	1.25177	(23.0) 6	9.96838	0.8501	1.25542	0.76441
23	9.90448	0.8121	0.97568	1.24763	7	9.96908	0.8529	1.25753	0.73875
24	9.90764	0.8139	0.98787	1.24333	8	9.96945	0.8550	1.25951	0.71133
25	9.91041	0.8172	0.99960	1.23887	9	9.96957	0.8559	1.26136	0.68191
26	+9.91262	-0.8212	+1.01092	-1.23423	10	+9.96965	-0.8555	+1.26308	-0.65021
27	9.91417	0.8252	1.02183	1.22943	11	9.96994	0.8537	1.26466	0.61585
28	9.91520	0.8282	1.03235	1.22444	12	9.97060	0.8509	1.26611	0.57838
29	9.91588	0.8301	1.04252	1.21928	13	9.97178	0.8478	1.26744	0.53722
30	9.91644	0.8306	1.05233	1.21393	14	9.97347	0.8451	1.26864	0.49158
31	+9.91713	-0.8299	+1.06182	-1.20839	15	+9.97551	-0.8436	+1.26971	-0.44041
Aug. 1	9.91810	0.8283	1.07098	1.20265	16	9.97764	0.8436	1.27065	0.38222
2	9.91942	0.8264	1.07984	1.19671	17	9.97964	0.8451	1.27146	0.31484
3	9.92112	0.8246	1.08841	1.19056	18	9.98128	0.8477	1.27215	0.23485
4	9.92313	0.8233	1.09669	1.18420	19	9.98236	0.8506	1.27271	0.13651
h 5	+9.92535	-0.8229	+1.10470	-1.17762	h 20	+9.98295	-0.8533	+1.27314	-0.00896
(21.0) 6	9.92767	0.8236	1.11246	1.17081	(0.0) 21	9.98316	0.8549	1.27345	9.82733
7	9.92996	0.8253	1.11995	1.16377	22	9.98315	0.8552	1.27363	-9.50850
8	9.93207	0.8280	1.12721	1.15648	23	9.98316	0.8542	1.27368	+8.43650
9	9.93384	0.8313	1.13423	1.14895	24	9.98337	0.8520	1.27361	9.57658
10	+9.93521	-0.8349	+1.14102	-1.14115	25	+9.98388	-0.8492	+1.27341	+9.86165
11	9.93614	0.8382	1.14758	1.13309	26	9.98474	0.8461	1.27308	0.03229
12	9.93670	0.8406	1.15393	1.12475	27	9.98592	0.8433	1.27262	0.15444
13	9.93707	0.8417	1.16007	1.11611	28	9.98732	0.8411	1.27204	0.24963
14	9.93746	0.8414	1.16601	1.10717	29	9.98889	0.8398	1.27132	0.32759
15	+9.93811	-0.8397	+1.17175	-1.09792	30	+9.99048	-0.8395	+1.27048	+0.39360
16	+9.93928	-0.8373	+1.17729	-1.08834	Oct. 1	+9.99202	-0.8401	+1.26951	+0.45080

E = +0''.03 = +0<sup>s</sup>.002

[Eph 15]

FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sid. Hr.)	Log A.	Log B.	Log C.	Log D.	Solar Day. (Sid. Hr.)	Log A.	Log B.	Log C.	Log D.
Oct. 1	+9.99202	-0.8401	+1.26951	+0.45080	Nov. 16	+0.04130	-0.7868	+1.04521	+1.21784
2	9.99334	0.8415	1.26840	0.50126	17	0.04178	0.7836	1.03458	1.22334
3	9.99441	0.8434	1.26717	0.54638	18	0.04250	0.7794	1.02354	1.22864
4	9.99514	0.8452	1.26580	0.58715	19	0.04351	0.7746	1.01207	1.23374
5	9.99555	0.8465	1.26429	0.62433	20	0.04487	0.7697	1.00015	1.23865
<sup>h</sup> (1.0) 6	+9.99572	-0.8468	+1.26265	+0.65847	<sup>h</sup> (4.0) 21	+0.04650	-0.7655	+0.98774	+1.24337
7	9.99581	0.8458	1.26088	0.69003	22	0.04828	0.7622	0.97483	1.24792
8	9.99603	0.8433	1.25896	0.71934	23	0.05017	0.7601	0.96138	1.25228
9	9.99657	0.8397	1.25691	0.74669	24	0.05205	0.7592	0.94735	1.25647
10	9.99757	0.8355	1.25471	0.77231	25	0.05382	0.7595	0.93270	1.26048
11	+9.99909	-0.8314	+1.25238	+0.79640	26	+0.05538	-0.7606	+0.91740	+1.26433
12	0.00100	0.8283	1.24990	0.81910	27	0.05668	0.7622	0.90139	1.26801
13	0.00312	0.8266	1.24727	0.84057	28	0.05770	0.7635	0.88462	1.27152
14	0.00514	0.8266	1.24449	0.86091	29	0.05847	0.7641	0.86703	1.27488
15	0.00690	0.8279	1.24157	0.88022	30	0.05908	0.7634	0.84855	1.27807
16	+0.00819	-0.8299	+1.23849	+0.89860	Dec. 1	+0.05970	-0.7612	+0.82910	+1.28111
17	0.00900	0.8318	1.23526	0.91611	2	0.06051	0.7573	0.80858	1.28399
18	0.00937	0.8329	1.23187	0.93283	3	0.06166	0.7524	0.78689	1.28672
19	0.00954	0.8326	1.22832	0.94881	4	0.06324	0.7471	0.76391	1.28930
20	0.00964	0.8310	1.22460	0.96410	5	0.06525	0.7424	0.73949	1.29173
<sup>h</sup> (2.0) 21	+0.00989	-0.8280	+1.22072	+0.97876	<sup>h</sup> (5.0) 6	+0.06756	-0.7391	+0.71347	+1.29400
22	0.01042	0.8241	1.21667	0.99282	7	0.07000	0.7379	0.68563	1.29614
23	0.01130	0.8199	1.21245	1.00631	8	0.07229	0.7387	0.65574	1.29812
24	0.01250	0.8158	1.20806	1.01928	9	0.07427	0.7409	0.62348	1.29996
25	0.01397	0.8122	1.20348	1.03176	10	0.07581	0.7438	0.58847	1.30166
26	+0.01560	-0.8096	+1.19872	+1.04376	11	+0.07693	-0.7463	+0.55024	+1.30322
27	0.01730	0.8080	1.19376	1.05532	12	0.07773	0.7476	0.50815	1.30463
28	0.01898	0.8074	1.18862	1.06646	13	0.07834	0.7474	0.46139	1.30590
29	0.02050	0.8078	1.18328	1.07720	14	0.07896	0.7454	0.40882	1.30703
30	0.02178	0.8088	1.17773	1.08755	15	0.07975	0.7421	0.34882	1.30803
31	+0.02278	-0.8100	+1.17197	+1.09754	16	+0.08081	-0.7380	+0.27903	+1.30888
Nov. 1	0.02348	0.8109	1.16600	1.10718	17	0.08214	0.7337	0.19565	1.30960
2	0.02393	0.8108	1.15981	1.11649	18	0.08373	0.7301	0.09217	1.31018
3	0.02428	0.8094	1.15339	1.12548	19	0.08552	0.7273	9.95586	1.31062
4	0.02470	0.8065	1.14673	1.13416	20	0.08741	0.7259	9.75584	1.31092
<sup>h</sup> (3.0) 5	+0.02538	-0.8022	+1.13983	+1.14255	<sup>h</sup> (6.0) 21	+0.08929	-0.7258	+9.37345	+1.31108
6	0.02647	0.7971	1.13269	1.15065	22	0.09110	0.7271	-8.98868	1.31111
7	0.02806	0.7919	1.12528	1.15847	23	0.09270	0.7294	9.63466	1.31100
8	0.03005	0.7874	1.11760	1.16603	24	0.09410	0.7322	9.88358	1.31076
9	0.03233	0.7845	1.10965	1.17333	25	0.09522	0.7351	0.04073	1.31037
10	+0.03461	-0.7833	+1.10141	+1.18038	26	+0.09610	-0.7374	-0.15580	+1.30985
11	0.03670	0.7838	1.09286	1.18719	27	0.09675	0.7385	0.24657	1.30919
12	0.03837	0.7854	1.08401	1.19376	28	0.09737	0.7380	0.32150	1.30840
13	0.03960	0.7873	1.07483	1.20011	29	0.09808	0.7360	0.38528	1.30746
14	0.04041	0.7885	1.06532	1.20624	30	0.09905	0.7325	0.44077	1.30638
15	+0.04089	-0.7884	+1.05545	+1.21215	31	+0.10039	-0.7284	-0.48985	+1.30516
16	+0.04130	-0.7868	+1.04521	+1.21784	32	+0.10212	-0.7247	-0.53382	+1.30380

$E = +0''.03 = +0^s.002$

[Eph 15]

FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sidereal Hour.)	<i>r</i>	<i>f</i>	<i>f'</i>	<i>G</i>		<i>H</i>		Log <i>g</i> .	Log <i>h</i> .	<i>i</i>
		In Time.	In Time.	In Arc.	In Time.	In Arc.	In Time.			
	<i>y</i>	<i>s</i>	<i>s</i>	<i>°</i> <i>'</i>	<i>h</i> <i>m</i>	<i>°</i> <i>'</i>	<i>h</i> <i>m</i>			<i>"</i>
Jan. 0	-0.0006	+0.554	+0.001	296 33.8	19 46.3	351 4.3	23 24.3	0.90782	1.31013	-1.38
1	+0.0021	0.567	0.006	297 11.0	19 48.7	350 7.9	23 20.5	0.91166	1.30992	1.52
2	0.0048	0.578	0.010	297 40.7	19 50.7	349 11.5	23 16.8	0.91600	1.30969	1.66
3	0.0076	0.590	0.011	298 1.8	19 52.1	348 15.0	23 13.0	0.92043	1.30943	1.80
h 4	0.0103	0.602	0.009	298 15.4	19 53.0	347 18.4	23 9.2	0.92433	1.30916	1.94
(7.0) 5	0.0130	+0.614	+0.004	298 24.6	19 53.6	346 21.8	23 5.5	0.92732	1.30886	-2.08
6	0.0158	0.626	-0.002	298 33.1	19 54.2	345 25.0	23 1.7	0.92914	1.30854	2.22
7	0.0185	0.638	0.009	298 45.4	19 55.0	344 28.2	22 57.9	0.92980	1.30821	2.36
8	0.0213	0.649	0.014	299 5.3	19 56.4	343 31.3	22 54.1	0.92968	1.30786	2.50
9	0.0240	0.661	0.016	299 34.4	19 58.3	342 34.3	22 50.3	0.92933	1.30749	2.64
10	0.0267	+0.672	-0.015	300 13.1	20 0.9	341 37.2	22 46.5	0.92947	1.30710	-2.77
11	0.0295	0.684	0.010	300 57.5	20 3.8	340 40.0	22 42.7	0.93062	1.30669	2.91
12	0.0322	0.695	-0.003	301 42.7	20 6.8	339 42.7	22 38.8	0.93315	1.30626	3.04
13	0.0350	0.706	+0.005	302 23.8	20 9.6	338 45.3	22 35.0	0.93698	1.30581	3.18
14	0.0377	0.718	0.012	302 56.0	20 11.7	337 47.7	22 31.2	0.94167	1.30535	3.31
15	0.0404	+0.729	+0.017	303 18.5	20 13.2	336 50.1	22 27.3	0.94663	1.30488	-3.44
16	0.0432	0.740	0.018	303 31.3	20 14.1	335 52.3	22 23.5	0.95131	1.30439	3.57
17	0.0459	0.751	0.016	303 38.1	20 14.5	334 54.4	22 19.6	0.95512	1.30389	3.70
18	0.0486	0.762	0.011	303 41.7	20 14.8	333 56.4	22 15.8	0.95796	1.30337	3.83
19	0.0514	0.773	+0.005	303 45.8	20 15.1	332 58.3	22 11.9	0.95977	1.30284	3.96
h 20	0.0541	+0.784	-0.002	303 53.3	20 15.6	331 59.9	22 8.0	0.96076	1.30230	-4.08
(8.0) 21	0.0569	0.795	0.007	304 5.8	20 16.4	331 1.5	22 4.1	0.96120	1.30174	4.21
22	0.0596	0.805	0.011	304 24.1	20 17.6	330 3.0	22 0.2	0.96148	1.30117	4.33
23	0.0623	0.816	0.013	304 47.6	20 19.2	329 4.3	21 56.3	0.96195	1.30059	4.45
24	0.0651	0.826	0.012	305 15.0	20 21.0	328 5.4	21 52.4	0.96289	1.30000	4.57
25	0.0678	+0.836	-0.010	305 44.6	20 23.0	327 6.5	21 48.4	0.96450	1.29939	-4.69
26	0.0706	0.847	-0.006	306 14.2	20 24.9	326 7.4	21 44.5	0.96694	1.29878	4.81
27	0.0733	0.857	0.000	306 41.1	20 26.7	325 8.1	21 40.5	0.97018	1.29816	4.93
28	0.0760	0.867	+0.005	307 3.5	20 28.2	324 8.6	21 36.6	0.97407	1.29754	5.04
29	0.0788	0.877	0.009	307 19.7	20 29.3	323 9.1	21 32.6	0.97836	1.29690	5.15
30	0.0815	+0.887	+0.011	307 29.0	20 29.9	322 9.3	21 28.6	0.98263	1.29626	-5.26
31	0.0842	0.897	0.010	307 32.1	20 30.1	321 9.4	21 24.6	0.98645	1.29562	5.37
Feb. 1	0.0870	0.906	0.007	307 31.5	20 30.1	320 9.4	21 20.6	0.98947	1.29496	5.48
2	0.0897	0.916	+0.001	307 30.3	20 30.0	319 9.1	21 16.6	0.99146	1.29431	5.59
3	0.0924	0.925	-0.006	307 32.6	20 30.2	318 8.8	21 12.6	0.99246	1.29365	5.69
h 4	0.0952	+0.935	-0.012	307 41.1	20 30.7	317 8.2	21 8.5	0.99272	1.29299	-5.79
(9.0) 5	0.0979	0.944	0.015	307 57.8	20 31.9	316 7.5	21 4.5	0.99271	1.29232	5.89
6	0.1007	0.953	0.015	308 22.3	20 33.5	315 6.5	21 0.4	0.99301	1.29167	5.99
7	0.1034	0.962	0.012	308 52.2	20 35.5	314 5.5	20 56.4	0.99412	1.29101	6.09
8	0.1061	0.971	-0.005	309 23.1	20 37.5	313 4.2	20 52.3	0.99631	1.29034	6.18
9	0.1089	+0.980	+0.003	309 50.8	20 39.4	312 2.8	20 48.2	0.99956	1.28968	-6.28
10	0.1116	0.989	0.010	310 11.5	20 40.8	311 1.2	20 44.1	1.00356	1.28902	6.37
11	0.1144	0.997	0.016	310 23.6	20 41.6	309 59.4	20 40.0	1.00781	1.28836	6.46
12	0.1171	1.006	0.018	310 27.8	20 41.9	308 57.6	20 35.9	1.01178	1.28772	6.54
13	0.1198	1.015	0.016	310 26.4	20 41.8	307 55.5	20 31.7	1.01508	1.28708	6.63
14	0.1226	+1.023	+0.012	310 22.5	20 41.5	306 53.3	20 27.6	1.01748	1.28645	-6.71
15	0.1253	+1.031	+0.007	310 19.5	20 41.3	305 50.9	20 23.4	1.01898	1.28581	-6.79

**FOR WASHINGTON MEAN MIDNIGHT.**



FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sidereal Hour.)	<i>r</i>	<i>f</i>	<i>f'</i>	<i>G</i>		<i>H</i>		Log <i>g</i> .	Log <i>h</i> .	<i>i</i>	<i>z</i>
		In Time.	In Time.	In Arc.	In Time.	In Arc.	In Time.				
	<i>y</i>	<i>s</i>	<i>s</i>	°   '   ''	h   m   s	°   '   ''	h   m   s			"	
Apr. 1	0.2485	+1.346	-0.015	317 26.4	21 9.8	257 36.7	17 10.4	1.07125	1.27527	-7.99	-0.0
2	0.2512	1.353	0.013	317 51.2	21 11.4	256 32.7	17 6.2	1.07112	1.27555	7.96	0.0
3	0.2540	1.360	0.008	318 18.5	21 13.2	255 28.9	17 1.9	1.07182	1.27585	7.93	0.0
4	0.2567	1.367	-0.001	318 44.5	21 15.0	254 25.2	16 57.7	1.07339	1.27618	7.89	0.0
5	0.2595	1.374	+0.007	319 5.7	21 16.4	253 21.6	16 53.4	1.07573	1.27652	7.86	0.0
h 6	0.2622	+1.381	+0.014	319 20.4	21 17.4	252 18.2	16 49.2	1.07846	1.27688	-7.82	-0.0
(13.0) 7	0.2649	1.388	0.018	319 27.9	21 17.9	251 14.9	16 45.0	1.08113	1.27726	7.78	0.0
8	0.2677	1.395	0.019	319 29.8	21 18.0	250 11.7	16 40.8	1.08332	1.27766	7.74	0.0
9	0.2704	1.402	0.016	319 28.7	21 17.9	249 8.7	16 36.6	1.08479	1.27808	7.69	0.0
10	0.2732	1.409	0.011	319 27.9	21 17.9	248 5.8	16 32.4	1.08548	1.27852	7.64	0.0
11	0.2759	+1.416	+0.004	319 29.5	21 18.0	247 3.2	16 28.2	1.08547	1.27897	-7.59	-0.0
12	0.2786	1.423	-0.002	319 36.0	21 18.4	246 0.7	16 24.0	1.08500	1.27944	7.54	0.0
13	0.2814	1.431	0.008	319 47.5	21 19.2	244 58.3	16 19.9	1.08429	1.27992	7.49	0.0
14	0.2841	1.438	0.012	320 4.0	21 20.3	243 56.1	16 15.7	1.08366	1.28042	7.43	0.0
15	0.2868	1.445	0.013	320 24.3	21 21.6	242 54.1	16 11.6	1.08338	1.28094	7.37	0.0
16	0.2896	+1.453	-0.012	320 46.7	21 23.1	241 52.3	16 7.5	1.08354	1.28146	-7.31	-0.0
17	0.2923	1.460	0.010	321 9.2	21 24.6	240 50.7	16 3.4	1.08431	1.28200	7.25	0.0
18	0.2950	1.468	-0.005	321 31.4	21 26.1	239 49.2	15 59.3	1.08562	1.28255	7.19	0.0
19	0.2978	1.476	0.000	321 50.1	21 27.3	238 48.0	15 55.2	1.08744	1.28311	7.12	0.0
20	0.3005	1.484	+0.004	322 4.8	21 28.3	237 47.0	15 51.1	1.08964	1.28368	7.05	0.0
h 21	0.3033	+1.492	+0.008	322 15.0	21 29.0	236 46.1	15 47.1	1.09194	1.28426	-6.98	-0.0
(14.0) 22	0.3060	1.499	0.009	322 20.6	21 29.4	235 45.5	15 43.0	1.09413	1.28485	6.91	0.0
23	0.3087	1.508	0.008	322 22.7	21 29.5	234 45.0	15 39.0	1.09589	1.28545	6.84	0.0
24	0.3115	1.516	+0.004	322 24.4	21 29.6	233 44.8	15 35.0	1.09702	1.28606	6.76	0.0
25	0.3142	1.524	-0.001	322 27.4	21 29.8	232 44.8	15 31.0	1.09747	1.28667	6.68	0.0
26	0.3170	+1.532	-0.007	322 35.0	21 30.3	231 45.0	15 27.0	1.09736	1.28728	-6.60	-0.0
27	0.3197	1.540	0.013	322 48.7	21 31.2	230 45.3	15 23.0	1.09689	1.28791	6.52	0.0
28	0.3224	1.549	0.016	323 9.3	21 32.6	229 45.9	15 19.1	1.09651	1.28853	6.44	0.0
29	0.3252	1.557	0.015	323 35.7	21 34.4	228 46.7	15 15.1	1.09660	1.28915	6.35	0.0
30	0.3279	1.566	0.011	324 5.0	21 36.3	227 47.7	15 11.2	1.09746	1.28978	6.26	0.0
May 1	0.3306	+1.575	-0.004	324 33.2	21 38.1	226 48.9	15 7.3	1.09925	1.29041	-6.17	-0.0
2	0.3334	1.583	+0.004	324 58.0	21 39.9	225 50.3	15 3.4	1.10171	1.29104	6.08	0.0
3	0.3361	1.592	0.012	325 15.9	21 41.1	224 51.8	14 59.5	1.10462	1.29168	5.99	0.0
4	0.3389	1.601	0.018	325 27.0	21 41.8	223 53.6	14 55.6	1.10756	1.29232	5.90	0.0
5	0.3416	1.610	0.020	325 32.2	21 42.1	222 55.6	14 51.7	1.11006	1.29295	5.80	0.0
h 6	0.3443	+1.619	+0.018	325 34.1	21 42.3	221 57.7	14 47.8	1.11193	1.29358	-5.70	-0.0
(15.0) 7	0.3471	1.628	0.014	325 35.7	21 42.4	221 0.1	14 44.0	1.11303	1.29421	5.60	0.0
8	0.3498	1.638	+0.007	325 39.5	21 42.6	220 2.6	14 40.2	1.11348	1.29483	5.50	0.0
9	0.3526	1.647	0.000	325 47.5	21 43.2	219 5.3	14 36.4	1.11345	1.29545	5.40	0.0
10	0.3553	1.656	-0.006	326 0.5	21 44.0	218 8.2	14 32.5	1.11321	1.29607	5.30	0.0
11	0.3580	+1.666	-0.010	326 18.2	21 45.2	217 11.3	14 28.8	1.11307	1.29668	-5.19	-0.0
12	0.3608	1.676	0.012	326 39.5	21 46.6	216 14.6	14 25.0	1.11324	1.29729	5.08	0.0
13	0.3635	1.685	0.012	327 2.8	21 48.2	215 18.1	14 21.2	1.11390	1.29789	4.98	0.0
14	0.3662	1.695	0.010	327 26.3	21 49.7	214 21.7	14 17.4	1.11508	1.29848	4.87	0.0
15	0.3690	1.705	0.006	327 48.4	21 51.2	213 25.6	14 13.7	1.11682	1.29907	4.76	0.0
16	0.3717	+1.715	-0.001	328 7.6	21 52.5	212 29.5	14 10.0	1.11901	1.29964	-4.65	-0.0
17	0.3744	+1.725	+0.003	328 22.8	21 53.5	211 33.7	14 6.2	1.12152	1.30021	-4.53	-0.0

FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sidereal Hour.)	r	f		G		H		Log g.	Log h.	i	Log i.
		In Time.	In Time.	In Arc.	In Time.	In Arc.	In Time.				
	y	s	s	° '	h m	° '	h m			"	
May 17	0.3744	+1.725	+0.003	328 22.8	21 53.5	211 33.7	14 6.2	1.12152	1.30021	-4.53	-0.6563
18	0.3772	1.735	0.007	328 33.6	21 54.2	210 38.0	14 2.5	1.12415	1.30077	4.42	0.6452
19	0.3799	1.745	0.009	328 40.1	21 54.7	209 42.5	13 58.8	1.12665	1.30131	4.30	0.6337
20	0.3827	1.755	0.009	328 43.2	21 54.9	208 47.2	13 55.1	1.12882	1.30185	4.18	0.6218
21	0.3854	1.766	+0.005	328 45.1	21 55.0	207 52.0	13 51.5	1.13047	1.30238	4.07	0.6093
h (16.0) 22	0.3881	+1.776	0.000	328 48.1	21 55.2	206 57.0	13 47.8	1.13149	1.30289	-3.95	-0.5964
23	0.3909	1.786	-0.006	328 54.8	21 55.7	206 2.1	13 44.1	1.13200	1.30339	3.83	0.5830
24	0.3936	1.797	0.012	329 6.7	21 56.4	205 7.4	13 40.5	1.13218	1.30388	3.71	0.5691
25	0.3964	1.808	0.016	329 25.0	21 57.7	204 12.8	13 36.9	1.13242	1.30435	3.58	0.5546
26	0.3991	1.818	0.017	329 48.7	21 59.2	203 18.4	13 33.2	1.13308	1.30482	3.46	0.5394
27	0.4018	+1.829	-0.014	330 15.3	22 1.0	202 24.1	13 29.6	1.13444	1.30527	-3.34	-0.5236
28	0.4046	1.840	-0.008	330 41.6	22 2.8	201 29.9	13 26.0	1.13661	1.30570	3.21	0.5070
29	0.4073	1.850	+0.001	331 4.2	22 4.3	200 35.9	13 22.4	1.13951	1.30613	3.09	0.4897
30	0.4100	1.861	0.009	331 21.0	22 5.4	199 41.9	13 18.8	1.14283	1.30653	2.96	0.4715
31	0.4128	1.872	0.016	331 31.2	22 6.1	198 48.1	13 15.2	1.14620	1.30691	2.83	0.4524
June 1	0.4155	+1.883	+0.019	331 35.6	22 6.4	197 54.4	13 11.6	1.14922	1.30729	-2.71	-0.4324
2	0.4183	1.894	0.019	331 36.6	22 6.4	197 0.8	13 8.1	1.15166	1.30764	2.58	0.4112
3	0.4210	1.906	0.016	331 36.9	22 6.5	196 7.3	13 4.5	1.15339	1.30799	2.45	0.3888
4	0.4237	1.917	0.010	331 38.8	22 6.6	195 13.9	13 0.9	1.15448	1.30832	2.32	0.3651
h (17.0) 5	0.4265	1.928	+0.003	331 44.4	22 7.0	194 20.5	12 57.4	1.15509	1.30863	2.19	0.3399
6	0.4292	+1.939	-0.003	331 54.4	22 7.6	193 27.3	12 53.8	1.15550	1.30892	-2.06	-0.3130
7	0.4320	1.950	0.008	332 8.6	22 8.6	192 34.1	12 50.3	1.15596	1.30919	1.92	0.2842
8	0.4347	1.962	0.011	332 26.1	22 9.7	191 41.1	12 46.7	1.15667	1.30945	1.79	0.2532
9	0.4374	1.973	0.011	332 45.4	22 11.0	190 48.0	12 43.2	1.15782	1.30969	1.66	0.2197
10	0.4402	1.984	0.010	333 4.6	22 12.3	189 55.1	12 39.7	1.15943	1.30991	1.52	0.1833
11	0.4429	+1.996	-0.007	333 22.6	22 13.5	189 2.2	12 36.1	1.16152	1.31011	-1.39	-0.1435
12	0.4456	2.007	-0.002	333 38.0	22 14.5	188 9.4	12 32.6	1.16403	1.31030	1.26	0.0995
13	0.4484	2.019	+0.003	333 49.7	22 15.3	187 16.6	12 29.1	1.16678	1.31047	1.12	0.0504
14	0.4511	2.030	0.007	333 57.3	22 15.8	186 23.9	12 25.6	1.16965	1.31062	0.99	9.9949
15	0.4538	2.042	0.009	334 0.9	22 16.1	185 31.2	12 22.1	1.17243	1.31074	0.85	9.9311
16	0.4566	+2.053	+0.010	334 1.2	22 16.1	184 38.5	12 18.6	1.17491	1.31086	-0.72	-9.8563
17	0.4593	2.065	0.007	334 0.1	22 16.0	183 45.9	12 15.1	1.17689	1.31095	0.58	9.7656
18	0.4621	2.076	+0.002	333 59.5	22 16.0	182 53.4	12 11.6	1.17833	1.31101	0.45	9.6508
19	0.4648	2.088	-0.004	334 1.4	22 16.1	182 0.8	12 8.1	1.17928	1.31106	0.31	9.4941
20	0.4675	2.099	0.010	334 8.1	22 16.5	181 8.3	12 4.6	1.17993	1.31110	0.18	9.2464
h (0) 21	0.4703	+2.111	-0.016	334 20.1	22 17.3	180 15.8	12 1.1	1.18054	1.31111	-0.04	-8.6101
22	0.4730	2.122	0.018	334 36.9	22 18.5	179 23.3	11 57.6	1.18147	1.31111	+0.10	+8.9770
23	0.4758	2.134	0.016	334 56.8	22 19.8	178 30.8	11 54.1	1.18298	1.31110	0.23	9.3625
24	0.4785	2.145	0.011	335 16.8	22 21.1	177 38.3	11 50.6	1.18520	1.31105	0.37	9.5633
25	0.4812	2.157	-0.003	335 34.2	22 22.3	176 45.8	11 47.1	1.18808	1.31099	0.50	9.7000
26	0.4840	+2.169	+0.005	335 46.5	22 23.1	175 53.3	11 43.6	1.19137	1.31091	+0.64	+9.8037
27	0.4867	2.180	0.013	335 53.1	22 23.5	175 0.8	11 40.1	1.19479	1.31081	0.77	9.8873
28	0.4894	2.192	0.018	335 54.3	22 23.6	174 8.2	11 36.5	1.19797	1.31070	0.91	9.9572
29	0.4922	2.203	0.019	335 51.8	22 23.5	173 15.6	11 33.0	1.20060	1.31056	1.04	0.0173
30	0.4949	2.214	0.017	335 48.3	22 23.2	172 23.0	11 29.5	1.20263	1.31040	1.18	0.0700
y 1	0.4977	+2.226	+0.012	335 46.0	22 23.1	171 30.4	11 26.0	1.20404	1.31023	+1.31	+0.1169
2	0.5004	+2.237	+0.005	335 46.6	22 23.1	170 37.7	11 22.5	1.20496	1.31004	+1.44	+0.1591



FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sidereal Hour.)	r	f	f'	G		H		Log g.	Log h.	i	Log i.
		In Time.	In Time.	In Arc.	In Time.	In Arc.	In Time.				
	y	s	s	° '	h m	° '	h m			"	
July 1	0.4977	+2.226	+0.012	335 46 0	22 23.1	171 30.4	11 26.0	1.20404	1.31023	+1.31	+0.116
2	0.5004	2.237	+0.005	335 46.6	22 23.1	170 37.7	11 22.5	1.20496	1.31004	1.44	0.155
3	0.5031	2.249	-0.001	335 51.1	22 23.4	169 44.9	11 19.0	1.20564	1.30983	1.58	0.197
4	0.5059	2.260	0.006	335 59.6	22 24.0	168 52.1	11 15.5	1.20631	1.30960	1.71	0.232
5	0.5086	2.271	0.010	336 11.1	22 24.7	167 59.2	11 11.9	1.20716	1.30936	1.84	0.265
h 6	0.5114	+2.283	-0.011	336 24.5	22 25.6	167 6.3	11 8.4	1.20839	1.30909	+1.97	+0.295
(19.0) 7	0.5141	2.294	0.010	336 38.1	22 26.5	166 13.3	11 4.9	1.20997	1.30881	2.10	0.323
8	0.5168	2.305	0.007	336 50.5	22 27.4	165 20.2	11 1.3	1.21198	1.30852	2.23	0.345
9	0.5196	2.316	-0.003	337 0.7	22 28.0	164 27.0	10 57.8	1.21433	1.30820	2.36	0.373
10	0.5223	2.327	+0.002	337 7.9	22 28.5	163 33.7	10 54.2	1.21692	1.30787	2.49	0.396
11	0.5250	+2.338	+0.006	337 11.4	22 28.8	162 40.4	10 50.7	1.21959	1.30752	+2.62	+0.418
12	0.5278	2.349	0.009	337 11.4	22 28.8	161 47.0	10 47.1	1.22222	1.30716	2.75	0.439
13	0.5305	2.360	0.010	337 8.5	22 28.6	160 53.5	10 43.6	1.22457	1.30679	2.88	0.459
14	0.5332	2.371	0.009	337 3.9	22 28.3	159 59.8	10 40.0	1.22654	1.30639	3.00	0.477
15	0.5360	2.382	+0.005	336 59.3	22 28.0	159 6.1	10 36.4	1.22802	1.30598	3.13	0.495
16	0.5387	+2.393	-0.001	336 56.7	22 27.8	158 12.3	10 32.8	1.22905	1.30555	+3.26	+0.512
17	0.5415	2.404	0.008	336 57.9	22 27.9	157 18.3	10 29.2	1.22972	1.30511	3.38	0.528
18	0.5442	2.414	0.014	337 3.4	22 28.2	156 24.3	10 25.6	1.23028	1.30466	3.50	0.544
19	0.5469	2.425	0.017	337 13.5	22 28.9	155 30.1	10 22.0	1.23102	1.30420	3.62	0.559
20	0.5497	2.435	0.017	337 26.9	22 29.8	154 35.8	10 18.4	1.23222	1.30373	3.74	0.573
h 21	0.5524	+2.446	-0.013	337 41.1	22 30.7	153 41.4	10 14.8	1.23400	1.30324	+3.86	+0.587
(20.0) 22	0.5552	2.457	-0.007	337 53.6	22 31.6	152 46.9	10 11.1	1.23638	1.30274	3.98	0.600
23	0.5579	2.466	+0.002	338 2.3	22 32.2	151 52.2	10 7.5	1.23921	1.30222	4.10	0.613
24	0.5606	2.476	0.009	338 5.8	22 32.4	150 57.4	10 3.8	1.24220	1.30169	4.22	0.623
25	0.5634	2.487	0.015	338 4.4	22 32.3	150 2.4	10 0.2	1.24501	1.30116	4.33	0.633
26	0.5661	+2.497	+0.018	337 59.6	22 32.0	149 7.3	9 56.5	1.24749	1.30061	+4.45	+0.643
27	0.5688	2.507	0.017	337 52.9	22 31.5	148 12.0	9 52.8	1.24939	1.30006	4.56	0.655
28	0.5716	2.517	0.013	337 47.2	22 31.1	147 16.6	9 49.1	1.25071	1.29949	4.67	0.665
29	0.5743	2.527	+0.007	337 44.0	22 30.9	146 21.0	9 45.4	1.25156	1.29892	4.78	0.679
30	0.5771	2.536	0.000	337 44.2	22 31.0	145 25.3	9 41.7	1.25211	1.29834	4.89	0.689
31	0.5798	+2.546	-0.005	337 48.1	22 31.2	144 29.4	9 38.0	1.25259	1.29775	+5.00	+0.699
Aug. 1	0.5825	2.556	0.009	337 55.2	22 31.7	143 33.3	9 34.2	1.25320	1.29716	5.11	0.708
2	0.5853	2.565	0.011	338 4.1	22 32.3	142 37.1	9 30.5	1.25406	1.29656	5.21	0.717
3	0.5880	2.575	0.010	338 13.7	22 32.9	141 40.6	9 26.7	1.25528	1.29595	5.32	0.725
4	0.5908	2.584	0.008	338 22.6	22 33.5	140 44.0	9 22.9	1.25684	1.29534	5.42	0.734
h 5	0.5935	+2.594	-0.004	338 29.6	22 34.0	139 47.2	9 19.1	1.25871	1.29472	+5.52	+0.742
(21.0) 6	0.5962	2.603	+0.001	338 34.1	22 34.3	138 50.2	9 15.3	1.26081	1.29410	5.62	0.749
7	0.5990	2.612	0.005	338 35.7	22 34.4	137 53.1	9 11.5	1.26302	1.29347	5.72	0.757
8	0.6017	2.621	0.009	338 34.1	22 34.3	136 55.8	9 7.7	1.26521	1.29284	5.81	0.764
9	0.6044	2.630	0.011	338 29.9	22 34.0	135 58.2	9 3.9	1.26718	1.29223	5.91	0.771
10	0.6072	+2.639	+0.010	338 23.8	22 33.6	135 0.5	9 0.0	1.26886	1.29160	+6.00	+0.771
11	0.6099	2.647	0.007	338 17.4	22 33.2	134 2.7	8 56.2	1.27011	1.29097	6.09	0.780
12	0.6126	2.656	+0.002	338 12.4	22 32.8	133 4.6	8 52.3	1.27092	1.29034	6.18	0.790
13	0.6153	2.665	-0.005	338 10.4	22 32.7	132 6.3	8 48.4	1.27140	1.28971	6.27	0.799
14	0.6181	2.673	0.011	338 12.4	22 32.8	131 7.8	8 44.5	1.27168	1.28909	6.36	0.800
15	0.6209	+2.682	-0.015	338 18.6	22 33.2	130 9.2	8 40.6	1.27202	1.28847	+6.44	+0.800
16	0.6236	+2.690	-0.017	338 28.3	22 33.9	129 10.4	8 36.7	1.27270	1.28785	+6.52	+0.811

FOR WASHINGTON MEAN MIDNIGHT.

Solar Day. (Sidereal Hour.)	$\tau$	$f$		$f'$		$G$		$H$		Log $g$ .	Log $h$ .	$i$	Log $i$ .
		In Time.	In Time.	In Time.	In Time.	In Arc.	In Time.	In Arc.	In Time.				
	$y$	$s$	$s$	$s$	$s$	$^{\circ}$	$h$ $m$	$^{\circ}$	$h$ $m$			$''$	
Aug. 16	0.6236	+2.690	-0.017	338 28.3	22 33.9	129 10.4	8 36.7	1.27270	1.28785	+6.52	+0.8146		
17	0.6263	2.698	0.014	338 39.3	22 34.6	128 11.4	8 32.8	1.27386	1.28725	6.61	0.8199		
18	0.6291	2.707	0.009	338 49.9	22 35.3	127 12.2	8 28.8	1.27556	1.28664	6.68	0.8251		
19	0.6318	2.715	-0.001	338 57.4	22 35.8	126 12.8	8 24.8	1.27769	1.28603	6.76	0.8301		
20	0.6346	2.723	+0.007	339 0.8	22 36.1	125 13.2	8 20.9	1.28011	1.28543	6.84	0.8349		
h 21	0.6373	+2.731	+0.013	338 59.5	22 36.0	124 13.5	8 16.9	1.28246	1.28484	+6.91	+0.8395		
(22.0) 22	0.6400	2.739	0.017	338 54.6	22 35.6	123 13.6	8 12.9	1.28450	1.28426	6.98	0.8440		
23	0.6428	2.746	0.017	338 47.6	22 35.2	122 13.5	8 8.9	1.28606	1.28369	7.05	0.8483		
24	0.6455	2.754	0.014	338 41.0	22 34.7	121 13.2	8 4.9	1.28712	1.28312	7.12	0.8524		
25	0.6482	2.762	0.008	338 36.2	22 34.4	120 12.7	8 0.8	1.28769	1.28257	7.18	0.8564		
26	0.6510	+2.769	+0.002	338 34.7	22 34.3	119 12.0	7 56.8	1.28794	1.28202	+7.25	+0.8603		
27	0.6537	2.777	-0.004	338 36.8	22 34.5	118 11.2	7 52.7	1.28808	1.28149	7.31	0.8639		
28	0.6565	2.784	0.009	338 42.1	22 34.8	117 10.2	7 48.7	1.28829	1.28097	7.37	0.8675		
29	0.6592	2.792	0.011	338 49.6	22 35.3	116 9.0	7 44.6	1.28872	1.28047	7.43	0.8708		
30	0.6619	2.799	0.011	338 58.2	22 35.9	115 7.7	7 40.5	1.28944	1.27997	7.48	0.8741		
31	0.6647	+2.806	-0.009	339 6.4	22 36.4	114 6.1	7 36.4	1.29048	1.27950	+7.54	+0.8772		
Sept. 1	0.6674	2.814	0.006	339 13.3	22 36.9	113 4.4	7 32.3	1.29181	1.27903	7.59	0.8801		
2	0.6702	2.821	-0.001	339 18.1	22 37.2	112 2.5	7 28.2	1.29337	1.27857	7.64	0.8829		
3	0.6729	2.828	+0.004	339 20.3	22 37.3	111 0.5	7 24.0	1.29508	1.27814	7.68	0.8855		
4	0.6756	2.835	0.008	339 19.7	22 37.2	109 58.4	7 19.9	1.29676	1.27773	7.73	0.8881		
h 5	0.6784	+2.842	+0.010	339 16.6	22 37.1	108 56.0	7 15.7	1.29835	1.27733	+7.77	+0.8904		
(22.0) 6	0.6811	2.849	0.010	339 11.8	22 36.8	107 53.5	7 11.6	1.29968	1.27695	7.81	0.8927		
7	0.6838	2.855	0.008	339 6.3	22 36.4	106 50.9	7 7.4	1.30064	1.27659	7.85	0.8948		
8	0.6866	2.862	+0.004	339 1.8	22 36.1	105 48.2	7 3.2	1.30123	1.27625	7.88	0.8968		
9	0.6893	2.869	-0.003	338 59.6	22 36.0	104 45.3	6 59.0	1.30146	1.27593	7.92	0.8986		
10	0.6920	+2.876	-0.009	339 1.0	22 36.1	103 42.3	6 54.8	1.30147	1.27563	+7.95	+0.9004		
11	0.6948	2.882	0.014	339 6.5	22 36.4	102 39.1	6 50.6	1.30149	1.27534	7.98	0.9019		
12	0.6975	2.889	0.016	339 15.5	22 37.0	101 35.9	6 46.4	1.30172	1.27507	8.00	0.9034		
13	0.7003	2.896	0.015	339 26.8	22 37.8	100 32.6	6 42.2	1.30236	1.27483	8.03	0.9047		
14	0.7030	2.902	0.010	339 38.1	22 38.5	99 29.2	6 38.0	1.30353	1.27462	8.05	0.9059		
15	0.7057	+2.909	-0.003	339 47.2	22 39.1	98 25.6	6 33.7	1.30514	1.27442	+8.07	+0.9070		
16	0.7085	2.915	+0.005	339 52.7	22 39.5	97 22.0	6 29.5	1.30701	1.27425	8.09	0.9079		
17	0.7112	2.922	0.012	339 54.0	22 39.6	96 18.4	6 25.2	1.30895	1.27410	8.11	0.9088		
18	0.7140	2.928	0.016	339 51.6	22 39.4	95 14.6	6 21.0	1.31070	1.27397	8.12	0.9094		
19	0.7167	2.935	0.017	339 46.7	22 39.1	94 10.8	6 16.7	1.31201	1.27387	8.13	0.9100		
h 20	0.7194	+2.941	+0.015	339 41.5	22 38.8	93 6.9	6 12.5	1.31284	1.27379	+8.14	+0.9104		
(0.0) 21	0.7222	2.948	0.010	339 37.8	22 38.5	92 3.0	6 8.2	1.31323	1.27373	8.14	0.9107		
22	0.7249	2.954	+0.003	339 36.9	22 38.5	90 59.0	6 3.9	1.31325	1.27369	8.15	0.9109		
23	0.7276	2.960	-0.003	339 39.7	22 38.6	89 55.0	5 59.7	1.31314	1.27368	8.15	0.9109		
24	0.7304	2.967	0.008	339 45.7	22 39.0	88 50.9	5 55.4	1.31307	1.27370	8.14	0.9109		
25	0.7331	+2.973	-0.011	339 54.4	22 39.6	87 46.9	5 51.1	1.31317	1.27374	+8.14	+0.9107		
26	0.7359	2.980	0.012	340 4.3	22 40.3	86 42.8	5 46.8	1.31358	1.27379	8.14	0.9104		
27	0.7386	2.986	0.010	340 14.4	22 41.0	85 38.6	5 42.6	1.31429	1.27387	8.13	0.9099		
28	0.7413	2.993	0.007	340 23.4	22 41.6	84 34.5	5 38.3	1.31529	1.27398	8.12	0.9093		
29	0.7441	2.999	-0.002	340 30.6	22 42.0	83 30.3	5 34.0	1.31654	1.27412	8.10	0.9086		
30	0.7468	+3.006	+0.002	340 35.4	22 42.4	82 26.2	5 29.7	1.31791	1.27428	+8.09	+0.9078		
Oct. 1	0.7496	+3.012	+0.006	340 37.7	22 42.5	81 22.1	5 25.5	1.31935	1.27446	+8.07	+0.9068		

FOR

MEAN

.

INDEPENDENT STAR-NUMBERS, 1915.229

FOR WASHINGTON MEAN MIDNIGHT.

yr Day. sideral (our.)	r	f	f'	G		H		Log g.	Log h.	i	Log i.
		In Time.	In Time.	In Arc.	In Time.	In Arc.	In Time.				
	y	s	s	° '	h m	° '	h m			"	
ov. 16	0.8755	+3.379	+0.002	344 29.1	22 57.9	33 54.1	2 15.6	1.35944	1.29877	+4.81	+0.6825
17	0.8782	3.389	-0.004	344 36.4	22 58.4	32 55.4	2 11.7	1.35967	1.29937	4.70	0.6718
18	0.8810	3.399	0.009	344 46.5	22 59.1	31 56.8	2 7.8	1.36002	1.29996	4.58	0.6608
19	0.8837	3.409	0.011	344 58.1	22 59.9	30 58.4	2 3.9	1.36065	1.30055	4.46	0.6493
20	0.8864	3.420	0.011	345 10.3	23 0.7	30 0.2	2 0.0	1.36160	1.30113	4.34	0.6374
h (10) 21	0.8892	+3.430	-0.008	345 21.7	23 1.4	29 2.1	1 56.1	1.36285	1.30170	+4.22	+0.6250
22	0.8919	3.440	-0.005	345 31.4	23 2.1	28 4.1	1 52.3	1.36431	1.30226	4.09	0.6121
23	0.8947	3.451	0.000	345 39.1	23 2.6	27 6.2	1 48.4	1.36596	1.30280	3.97	0.5986
24	0.8974	3.462	+0.004	345 44.2	23 2.9	26 8.4	1 44.6	1.36766	1.30333	3.84	0.5846
25	0.9002	3.472	0.008	345 47.1	23 3.1	25 10.8	1 40.7	1.36935	1.30384	3.72	0.5700
26	0.9029	+3.483	+0.009	345 47.9	23 3.2	24 13.2	1 36.9	1.37088	1.30434	+3.59	+0.5547
27	0.9056	3.494	0.009	345 47.5	23 3.2	23 15.8	1 33.1	1.37219	1.30484	3.46	0.5387
28	0.9084	3.505	0.006	345 46.9	23 3.1	22 18.5	1 29.2	1.37323	1.30531	3.33	0.5219
29	0.9111	3.516	+0.001	345 47.2	23 3.1	21 21.3	1 25.4	1.37399	1.30577	3.19	0.5043
30	0.9138	3.527	-0.005	345 49.6	23 3.3	20 24.1	1 21.6	1.37452	1.30620	3.06	0.4858
Dec. 1	0.9166	+3.538	-0.011	345 55.0	23 3.7	19 27.1	1 17.8	1.37497	1.30663	+2.93	+0.4664
2	0.9193	3.550	0.016	346 3.6	23 4.2	18 30.2	1 14.0	1.37551	1.30704	2.79	0.4458
3	0.9220	3.561	0.018	346 14.9	23 5.0	17 33.3	1 10.2	1.37631	1.30743	2.66	0.4242
4	0.9248	3.572	0.016	346 27.4	23 5.8	16 36.5	1 6.4	1.37751	1.30781	2.52	0.4012
h 0) 5	0.9275	3.584	0.011	346 39.4	23 6.6	15 39.8	1 2.7	1.37916	1.30816	2.38	0.3768
6	0.9302	+3.595	-0.004	346 49.2	23 7.3	14 43.2	0 58.9	1.38117	1.30850	+2.24	+0.3507
7	0.9330	3.607	+0.005	346 55.7	23 7.7	13 46.6	0 55.1	1.38342	1.30882	2.10	0.3229
8	0.9357	3.618	0.013	346 58.3	23 7.9	12 50.1	0 51.3	1.38563	1.30911	1.96	0.2930
9	0.9385	3.630	0.018	346 57.8	23 7.9	11 53.7	0 47.6	1.38762	1.30938	1.82	0.2608
10	0.9412	3.642	0.019	346 55.5	23 7.7	10 57.3	0 43.8	1.38923	1.30965	1.68	0.2257
11	0.9439	+3.654	+0.017	346 53.0	23 7.5	10 0.9	0 40.1	1.39043	1.30989	+1.54	+0.1875
12	0.9467	3.665	0.012	346 52.1	23 7.5	9 4.7	0 36.3	1.39126	1.31010	1.40	0.1454
13	0.9494	3.677	+0.005	346 53.6	23 7.6	8 8.5	0 32.6	1.39182	1.31030	1.26	0.0987
14	0.9522	3.689	-0.002	346 58.2	23 7.9	7 12.3	0 28.8	1.39231	1.31047	1.11	0.0461
15	0.9549	3.701	0.007	347 5.3	23 8.4	6 16.1	0 25.1	1.39289	1.31063	0.97	9.9861
16	0.9576	+3.713	-0.010	347 14.2	23 8.9	5 20.0	0 21.3	1.39369	1.31076	+0.83	+9.9163
17	0.9604	3.725	0.010	347 23.6	23 9.6	4 23.9	0 17.6	1.39476	1.31088	0.68	9.8329
18	0.9631	3.736	0.009	347 32.4	23 10.2	3 27.8	0 13.9	1.39610	1.31098	0.54	9.7294
19	0.9658	3.748	0.005	347 39.9	23 10.7	2 31.8	0 10.1	1.39771	1.31104	0.39	9.5931
20	0.9686	3.760	-0.001	347 45.3	23 11.0	1 35.8	0 6.4	1.39942	1.31109	0.25	9.3931
0) 21	0.9713	+3.772	+0.004	347 48.7	23 11.2	0 39.7	0 2.6	1.40121	1.31111	+0.10	+9.0107
22	0.9741	3.784	0.007	347 49.4	23 11.3	359 43.6	23 58.9	1.40300	1.31111	-0.04	-8.6260
23	0.9768	3.796	0.010	347 48.3	23 11.2	358 47.6	23 55.2	1.40463	1.31110	0.19	9.2719
24	0.9795	3.808	0.010	347 45.9	23 11.1	357 51.5	23 51.4	1.40610	1.31107	0.33	9.5208
25	0.9823	3.820	0.008	347 43.1	23 10.9	356 55.4	23 47.7	1.40730	1.31100	0.48	9.6780
26	0.9850	+3.832	+0.003	347 40.8	23 10.7	355 59.3	23 44.0	1.40824	1.31092	-0.62	-9.7931
27	0.9878	3.844	-0.003	347 40.0	23 10.7	355 3.1	23 40.2	1.40891	1.31081	0.76	9.8838
28	0.9905	3.856	0.009	347 41.8	23 10.8	354 6.9	23 36.5	1.40948	1.31069	0.91	9.9588
29	0.9932	3.868	0.015	347 46.4	23 11.1	353 10.7	23 32.7	1.41007	1.31055	1.05	0.0226
30	0.9960	3.880	0.018	347 53.6	23 11.6	352 14.4	23 29.0	1.41084	1.31038	1.20	0.0780
31	0.9987	+3.892	-0.018	348 2.3	23 12.2	351 18.1	23 25.2	1.41194	1.31019	-1.34	-0.1271
32	1.0014	+3.903	-0.014	348 11.0	23 12.7	350 21.7	23 21.4	1.41344	1.30998	-1.48	-0.1711

230 BESSELIAN AND INDEPENDENT STAR-NUMBERS, 1915.

FOR WASHINGTON SIDEREAL TWELVE HOURS.

Mean Solar Date.	Log A <sub>1</sub> .	Log B <sub>1</sub> .	Log C.	Log D.	f	G <sub>1</sub>	H	Log g <sub>1</sub> .	Log h.	Log i.
				.	s	° '	° '			
Jan. 0.72	+9.2573	-0.8651	-0.5110	+1.3045	+0.557	296 19	350 52	0.9126	1.3101	-0.1483
10.70	9.3405	0.8683	0.8100	1.2838	0.674	300 44	341 26	0.9340	1.3070	0.4473
20.67	9.4068	0.8745	0.9761	1.2475	0.786	304 20	331 50	0.9576	1.3022	0.6134
30.64	9.4602	0.8826	1.0853	1.1928	0.888	307 10	322 1	0.9811	1.2962	0.7226
Feb. 9.61	9.5034	0.8910	1.1611	1.1145	0.981	309 23	311 56	1.0029	1.2896	0.7984
19.59	+9.5389	-0.8985	-1.2137	+1.0023	+1.065	311 13	301 34	1.0221	1.2833	-0.8510
Mar. 1.56	9.5685	0.9040	1.2483	0.8323	1.139	312 48	290 59	1.0384	1.2781	0.8856
11.53	9.5940	0.9066	1.2678	+0.5247	1.208	314 18	280 14	1.0519	1.2748	0.9051
21.50	9.6171	0.9057	1.2736	-9.2669	1.274	315 53	269 26	1.0630	1.2737	0.9109
31.48	9.6390	0.9012	1.2665	0.5670	1.340	317 37	258 42	1.0725	1.2750	0.9038
Apr. 10.45	+9.6608	-0.8934	-1.2461	-0.8492	+1.409	319 33	248 9	1.0814	1.2785	-0.8834
20.42	9.6832	0.8827	1.2114	1.0095	1.484	321 42	237 52	1.0905	1.2836	0.8486
30.40	9.7066	0.8700	1.1601	1.1161	1.565	323 59	227 54	1.1006	1.2897	0.7973
May 10.37	9.7310	0.8562	1.0879	1.1909	1.655	326 21	218 16	1.1126	1.2960	0.7252
20.34	9.7561	0.8425	0.9864	1.2439	1.753	328 40	208 56	1.1266	1.3018	0.6237
30.31	+9.7815	-0.8302	-0.8377	-1.2798	+1.859	330 50	199 52	1.1424	1.3065	-0.4750
June 9.28	9.8068	0.8204	0.5898	1.3016	1.971	332 46	190 59	1.1598	1.3096	0.2271
19.26	9.8312	0.8139	-9.9005	1.3107	2.085	334 23	182 14	1.1782	1.3110	-9.5378
29.23	9.8546	0.8112	+0.3647	1.3078	2.200	335 42	173 30	1.1969	1.3106	+0.0020
July 9.20	9.8763	0.8123	0.7293	1.2926	2.313	336 42	164 43	1.2152	1.3083	0.3666
19.18	+9.8962	-0.8166	+0.9171	-1.2644	+2.422	337 27	155 48	1.2327	1.3044	+0.5544
29.15	9.9141	0.8232	1.0389	1.2211	2.524	337 58	146 41	1.2490	1.2991	0.6762
Aug. 8.12	9.9300	0.8310	1.1245	1.1592	2.618	338 20	137 17	1.2638	1.2931	0.7618
18.09	9.9441	0.8387	1.1857	1.0723	2.703	338 37	127 36	1.2771	1.2869	0.8230
28.07	9.9564	0.8451	1.2287	0.9473	2.781	338 53	117 37	1.2886	1.2812	0.8659
Sept. 7.04	+9.9674	-0.8491	+1.2566	-0.7508	+2.852	339 12	107 20	1.2987	1.2768	+0.8938
17.01	9.9774	0.8500	1.2711	-0.3491	2.919	339 36	96 49	1.3076	1.2742	0.9084
26.98	9.9869	0.8471	1.2729	+0.0958	2.983	340 7	86 12	1.3156	1.2738	0.9102
Oct. 6.96	9.9963	0.8402	1.2618	0.6732	3.048	340 48	75 32	1.3232	1.2758	0.8991
16.93	0.0061	0.8294	1.2371	0.9061	3.118	341 38	64 59	1.3308	1.2799	0.8744
26.90	+0.0166	-0.8151	+1.1967	+1.0484	+3.194	342 35	54 36	1.3390	1.2855	+0.8340
Nov. 5.88	0.0279	0.7985	1.1371	1.1456	3.278	343 36	44 26	1.3479	1.2920	0.7744
15.85	0.0402	0.7806	1.0519	1.2142	3.372	344 39	34 32	1.3580	1.2984	0.6892
25.82	0.0533	0.7633	0.9278	1.2617	3.476	345 39	24 52	1.3691	1.3040	0.5651
Dec. 5.79	0.0670	0.7482	0.7320	1.2924	3.587	346 32	15 23	1.3811	1.3083	0.3691
15.77	+0.0809	-0.7371	+0.3314	+1.3083	+3.704	347 16	6 1	1.3937	1.3107	+0.9689
25.74	0.0947	0.7311	-0.0711	1.3102	3.823	347 49	356 42	1.4065	1.3110	-9.7084
35.71	+0.1079	-0.7306	-0.6501	+1.2985	+3.941	348 11	347 20	1.4192	1.3092	-0.2874

E=+0°.002.

The above numbers give the same reductions from mean to apparent place as are employed in computing the apparent places of the fixed stars, given on pages 287 to 486, from the mean places, given on pages 233 to 250. In order to render exact interpolation possible through intervals of ten days, all short period terms have been omitted.

FOR W

MEAN MIDNIGHT.

232 TERMS OF SHORT-PERIOD IN THE NUTATION, 1

FOR WASHINGTON MEAN MIDNIGHT.

Date.	$\delta''\psi$	$\delta''\omega$	Date.	$\delta''\psi$	$\delta''\omega$	Date.	$\delta''\psi$	$\delta''\omega$	Date.	$\delta''\psi$
	"	"		"	"		"	"		"
July 1	+0.19	+0.09	Aug. 16	-0.27	0.00	Oct. 1	+0.10	-0.07	Nov. 16	+0.03
2	+0.09	0.10	17	0.23	-0.05	2	0.14	-0.04	17	-0.07
3	-0.02	0.09	18	0.14	0.09	3	0.16	+0.01	18	0.14
4	0.11	0.07	19	-0.02	0.11	4	0.13	0.05	19	0.18
5	0.16	+0.03	20	+0.11	0.10	5	+0.07	0.08	20	0.17
6	0.18	-0.01	21	0.22	0.07	6	-0.02	0.10	21	0.14
7	0.16	0.05	22	0.27	-0.02	7	0.12	0.10	22	-0.07
8	0.12	0.08	23	0.27	+0.03	8	0.20	0.07	23	0.00
9	-0.05	0.10	24	0.22	0.08	9	0.25	+0.03	24	+0.07
10	+0.03	0.09	25	0.13	0.10	10	0.25	-0.02	25	0.12
11	+0.10	-0.07	26	+0.03	+0.10	11	-0.19	-0.07	26	+0.15
12	0.15	-0.04	27	-0.07	0.08	12	-0.08	0.10	27	0.14
13	0.17	0.00	28	0.14	0.05	13	+0.05	0.11	28	0.10
14	0.15	+0.05	29	0.18	+0.01	14	0.17	0.09	29	+0.02
15	+0.08	0.08	30	0.18	-0.03	15	0.26	-0.05	30	-0.08
16	-0.02	0.10	31	0.15	0.07	16	0.30	0.00	Dec. 1	0.18
17	0.12	0.10	Sept. 1	0.09	0.09	17	0.27	+0.05	2	0.26
18	0.22	0.07	2	-0.02	0.10	18	0.20	0.09	3	0.29
19	0.28	+0.03	3	+0.06	0.09	19	+0.10	0.10	4	0.26
20	0.28	-0.02	4	0.12	0.06	20	-0.01	0.10	5	0.18
21	-0.22	-0.07	5	+0.16	-0.02	21	-0.11	+0.07	6	-0.06
22	-0.11	0.10	6	0.17	+0.02	22	0.17	+0.04	7	+0.08
23	+0.02	0.11	7	0.13	0.06	23	0.19	-0.01	8	0.21
24	0.15	0.09	8	+0.06	0.09	24	0.17	0.05	9	0.29
25	0.25	-0.05	9	-0.04	0.10	25	0.13	0.08	10	0.31
26	0.29	0.00	10	0.14	0.09	26	-0.06	0.09	11	0.27
27	0.27	+0.05	11	0.22	0.06	27	+0.01	0.09	12	0.19
28	0.21	0.08	12	0.26	+0.01	28	0.08	0.08	13	+0.08
29	0.11	0.10	13	0.24	-0.04	29	0.13	0.05	14	-0.03
30	+0.01	0.10	14	0.16	0.08	30	0.15	-0.01	15	0.11
31	-0.09	+0.08	15	-0.05	-0.11	31	+0.14	+0.03	16	-0.16
Aug. 1	0.15	+0.04	16	+0.08	0.10	Nov. 1	+0.08	0.07	17	0.17
2	0.18	0.00	17	0.19	0.08	2	0.00	0.10	18	0.14
3	0.17	-0.04	18	0.27	-0.03	3	-0.10	0.10	19	0.08
4	0.13	0.07	19	0.28	+0.02	4	0.19	0.08	20	-0.01
5	-0.07	0.09	20	0.24	0.06	5	0.26	+0.05	21	+0.06
6	+0.01	0.09	21	0.16	0.09	6	0.27	0.00	22	0.12
7	0.08	0.08	22	+0.05	0.10	7	0.22	-0.05	23	0.16
8	0.14	0.05	23	-0.05	0.09	8	-0.12	0.09	24	0.16
9	0.17	-0.01	24	0.13	0.06	9	+0.01	0.11	25	0.12
10	+0.16	+0.03	25	-0.18	+0.02	10	+0.14	-0.10	26	+0.06
11	0.11	0.07	26	0.19	-0.02	11	0.25	0.06	27	-0.04
12	+0.03	0.10	27	0.16	0.07	12	0.30	-0.02	28	0.15
13	-0.08	0.10	28	0.11	0.08	13	0.30	+0.03	29	0.24
14	0.18	0.09	29	-0.04	0.09	14	0.24	0.08	30	0.29
15	0.25	+0.05	30	+0.03	0.09	15	0.14	0.10	31	0.29
16	-0.27	0.00	Oct. 1	+0.10	-0.07	16	+0.03	+0.10	32	-0.23

JANUARY 0<sup>d</sup>.732.

13 Ceti, dup. 5<sup>m</sup>.5, 6<sup>m</sup>.2, 0<sup>h</sup>.3  
 α Cassiop., var. irreg. 2<sup>m</sup>.2, 2<sup>m</sup>.8  
 γ Cassiop. comp. 7<sup>m</sup>.6, 4<sup>h</sup> s. pr.

β Phoenicia, dup. 4<sup>m</sup>.2, 4<sup>m</sup>.2, 1<sup>h</sup>.  
 ζ Piscium, star 6<sup>m</sup>.5, 24<sup>h</sup> n. l.

α Tucanae, comp. 7<sup>m</sup>, 6<sup>h</sup> n.  
 α Ursae Min., star 9<sup>m</sup>, 18<sup>h</sup> s. pr.

[Eph 15]



JANUARY  $\phi^d.73a$ 

• Sculptoris, comp.  $9^m$ ,  $5''$  n. f. | • Cassiop., triple,  $7^m$ ,  $8^m$ ,  $2''$ ,  $3''$  | • Octl. comp.  $6^m.2$ ,  $2''$ ,  $7$  pr.  
 • Ceti, var.,  $331^d$ ,  $1^m$ ,  $7-9^m.6$ , star  $9^m$  f.  $8^s$  | [Eph 13]

JANUARY 0<sup>d</sup>. 732.

7 Persei, star  $\delta^m.5$ ,  $25''$  n. pr.  
 8 Arietis, dup.,  $5^m.2$ ,  $5^m.6$ ,  $1''$ . 3  
 9 Eridani, comp.  $4^m.4$ ,  $1''$ . 5  
 10 Persei, var. irreg.,  $3^m.4$ - $4^m.5$

11 Persei, var.  $2^d.87$ ,  $2^m.1$ - $3^m.5$   
 12 Eridani, comp.  $7^m$ ,  $1''$ . 4 n. pr.  
 13 Horologii, remarkable purplish red  
 star.  
 14 Eridani, comp.  $9^m$ ,  $2''$ . 7

15 Tauri, quad., comp.  $6^m.3$ ,  $7^m.6$ ,  
 $8^m.2$ ,  $117''$ ,  $181''$ ,  $190''$   
 16 H. Camelop., comp.  $8^m$ ,  $1''$ . 9 n. l.  
 17 Persei, comp.  $8^m$ ,  $8''$ . 6 n. l.  
 18 Tauri, var.,  $3^d.93$ ,  $3^m.2$ - $4^m.3$

JANUARY  $\phi^h.732$ .

$\lambda$  Tauri, star  $6^m.5$  f.  $38^s$ ,  $270''$  a.  
 $\mu$  Persei, star  $6^m$ ,  $115''$  a. pr.

$\epsilon$  Aurigæ, var. irreg.,  $3^m.0-4^m.5$ .  
 [Rph 15]

$\theta$  Orionis, comp.  $6^m.0$ ,  $9''.5$  a. 1

JANUARY  $\odot^d.752$ 

1 Orion, star  $6^m.9, 33'' .6$  n.  
 Orion, comp.  $7^m.3, 21'' .5$  s. f.  
 Orion, comp.  $4^m.2, 8'' .4$  s. f.

2 Orion, red star, var. irreg.  $1^m.0-1^m.4$ .  
 3 Aurigæ, comp.  $7^m.5, 2'' .5$  n. pr.  
 4 Puppis, star,  $5^m.8, 150''$  s. f.

[Eph 13]

5 Gem, var.  $231^d.4, 3^m.2-4^m.2$ , comp.  $8^m.8, 1''$  s. n. pr.  
 6 Monoc, star  $6^m.5, 13'' .7$  n. f.  
 7 Monoc., comp.  $8^m.8, 2'' .9$  s. pr.

WASHINGTON, JANUARY <sup>o</sup>d.732.

Name of Star.	Magni- tude.	Right Ascension.			Annual Variation.	Declination.			Al Var
		h	m	s		°	'	"	
$\alpha$ Canis Majoris ( <i>Sirius</i> ) †	-1.6	6	41	24.147	+ 2.6434	-16	35	55.77	-
18 Monocerotis . . .	4.7	6	43	25.707	3.1281	+ 2	30	21.80	
43 Camelopardalis . . .	5.1	6	44	32.874	+ 6.4884	+68	59	19.96	
$\zeta$ Mensæ . . . . .	5.6	6	47	8.432	- 4.9417	-80	43	30.15	
$\theta$ Geminorum . . . . .	3.6	6	47	11.329	+ 3.9582	+34	3	53.33	
$\alpha$ Pictoris . . . . .	3.3	6	47	19.240	+ 0.6176	-61	51	0.16	-
$\tau$ Argûs . . . . .	2.8	6	47	49.608	1.4883	-50	30	47.80	
15 Lyncis . . . . . †	4.5	6	49	55.390	5.2069	+58	32	8.08	
$\theta$ Canis Majoris . . . . .	4.2	6	50	14.472	2.7879	-11	55	52.50	
$\epsilon$ Canis Majoris . . . . . †	1.6	6	55	17.102	2.3574	-28	51	20.52	
$\zeta$ Geminorum . . . . . †	var.	6	59	4.127	+ 3.5606	+20	41	45.29	-
$\sigma^2$ Canis Majoris . . . . .	3.1	6	59	28.510	2.5048	-23	42	30.00	
$\gamma$ Canis Majoris . . . . .	4.1	6	59	54.790	2.7148	-15	30	24.90	
51 H. Cephei . . . . .	5.3	7	1	5.64*	29.2318	+87	11	5.45	
$\delta$ Canis Majoris . . . . .	2.0	7	4	56.055	2.4381	-26	15	27.17	
63 Aurigæ . . . . .	5.1	7	5	48.725	+ 4.1329	+39	27	37.06	-
51 Geminorum . . . . .	5.3	7	8	29.521	+ 3.4480	+16	18	14.88	
$\gamma^2$ Volantis . . . . . †	3.9	7	9	28.283	- 0.5012	-70	21	39.88	
$\lambda$ Geminorum . . . . .	3.6	7	13	12.571	+ 3.4502	+16	41	40.50	
25 H. Camelopardalis . . . . .	5.1	7	13	16.654	12.8254	+82	34	42.85	
$\pi$ Argûs . . . . .	2.7	7	14	8.442	+ 2.1189	-36	56	40.18	-
$\delta$ Geminorum . . . . . †	3.5	7	15	2.913	+ 3.5865	+22	8	23.28	
$\delta$ Volantis . . . . .	4.0	7	16	52.998	- 0.0194	-67	48	6.13	
7 Octantis (G.) . . . . .	6.4	7	17	0.79*	-20.2238	-86	53	53.55	
$\iota$ Geminorum . . . . .	3.9	7	20	26.978	+ 3.7304	+27	58	4.77	
$\eta$ Canis Majoris . . . . .	2.4	7	20	44.023	+ 2.3738	-29	8	11.78	-
Groombridge 1308 . . . . .	5.8	7	22	2.963	6.2749	+68	38	27.05	
$\beta$ Canis Minoris . . . . .	3.1	7	22	32.538	3.2554	+ 8	27	41.16	
$\rho$ Geminorum . . . . .	4.2	7	23	38.789	3.8631	+31	57	16.89	
$\sigma$ Argûs . . . . . †	3.3	7	26	31.996	1.9016	-43	7	43.66	
$\alpha^2$ Geminorum ( <i>Castor</i> ) . . . . .	2.0	7	29	10.736	+ 3.8332	+32	4	34.45	-
$\alpha^1$ Geminorum . . . . .	2.8	$\Delta\alpha$ - 0.264			. . . . .	$\Delta\delta$ - 4.13			.
25 Monocerotis . . . . .	5.2	7	33	3.100	2.9819	- 3	55	13.16	
$\alpha$ Can. Min. . ( <i>Procyon</i> ) †	0.5	7	34	51.192	3.1421	+ 5	26	36.57	
24 Lyncis . . . . .	5.0	7	35	49.392	5.0937	+58	54	37.89	
$\kappa$ Geminorum . . . . . †	3.7	7	39	19.122	+ 3.6265	+24	36	9.66	-
$\beta$ Geminorum ( <i>Pollux</i> ) . . . . .	1.2	7	40	7.018	3.6758	+28	13	56.71	
4 Puppis . . . . .	5.1	7	42	2.035	2.7636	-14	21	23.32	
$\xi$ Argûs . . . . .	3.5	7	45	43.165	2.5232	-24	38	44.72	
$\phi$ Geminorum . . . . .	5.0	7	48	17.882	3.6766	+26	59	12.46	
26 Lyncis . . . . .	5.7	7	48	31.771	+ 4.3814	+47	47	9.69	-
Groombridge 1374 . . . . .	5.6	7	50	2.805	7.2441	+74	8	48.11	
$\chi$ Argûs . . . . .	3.6	7	54	37.092	1.5259	-52	45	14.71	
$\omega$ Cancri . . . . .	5.9	7	55	47.407	3.6339	+25	37	34.86	
$\chi$ Geminorum . . . . .	5.0	7	58	18.059	3.6903	+28	2	0.52	
27 Lyncis . . . . .	4.9	8	2	4.338	+ 4.5299	+51	45	10.18	-
$\rho$ Argûs . . . . .	2.9	8	3	55.427	2.5546	-24	3	30.65	
3 H. Ursæ Majoris . . . . .	5.5	8	4	22.221	+ 6.0120	+68	43	32.57	-

15 Lyncis, dup., 4<sup>m</sup>.9, 6<sup>m</sup>.2, 0<sup>''</sup>.7  
 $\epsilon$  Can. Maj., comp. 9<sup>m</sup>, 7<sup>''</sup>.8 s. f.  
 $\zeta$  Gem., var., 10<sup>d</sup>.15, 3<sup>m</sup>.7-4<sup>m</sup>.3

$\gamma^2$  Volantis, comp. 5<sup>m</sup>.8, 12<sup>''</sup>.9 n. pr.  
 $\delta$  Gem., comp. 8<sup>m</sup>, 7<sup>''</sup>.0 s. pr.

$\sigma$  Argûs, star. 8<sup>m</sup>, 22<sup>''</sup>.4 n. f.  
 $\kappa$  Gem., comp. 8<sup>m</sup>, 5, 6<sup>''</sup>.6 s. pr.

Positions given for Sirius and Procyon are those of the centers of their orbits. Corrections given on remain to be applied to reduce to the positions of the stars.

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$\pi$ . $\alpha^6$ , $6^m.3$ , $1''$ $\delta$ . $\beta$ . $\lambda$ . $\mu$ .	$\epsilon$ Hydre, triple; binary $3^m.5$ $6^m.8$ , $0''.3$ , with comp. $7^m.8$ , $3''.3$ $\delta$ Argüs, comp. $5^m$ , $1''$ $\mu$ . $\epsilon^2$ Canceri, dup. $5^m.9$ , $6^m.4$ , $1''.4$	$\delta^1$ Carine, comp. $7^m.2$ , $5''$ $\beta$ . $\epsilon^2$ Urs. Mai, binary $6^m.9$ , $6^m$ , $1''$ $\beta$ . $\psi$ Argüs, dup. $5^m.8$ , $6^m.2$ , $0''.2$
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[Hph 15]

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v Argûs, comp. 6<sup>m</sup>.0, 4<sup>n</sup>.9 s. f.  
 γ Leonis, comp. 3<sup>m</sup>.8, 3<sup>n</sup>.7 s. f.

| 4 Argûs, var. irreg., 1<sup>m</sup> 6-6<sup>m</sup>.6  
 | μ Argûs, comp. 7<sup>m</sup>, 2<sup>n</sup>.2 n. f.  
 [Rph 15]

| 81 Chem., star 5<sup>m</sup>.5 pr. 32<sup>s</sup>, 256<sup>n</sup>.1  
 | 54 Leonis, comp. 6<sup>m</sup>.3, 6<sup>n</sup>.4 s. f.

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1 Lambda, comp.  $6^m.8, 2''.6$  n. f.  
 2 Can. Ven., star  $8^m, 11''.6$  n. pr.  
 3 Crvl, star  $8^m, 24''.4$  n. pr.

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7 Crucis, star  $6^m.6, 85''$  n. f.  
 24 Comae, star  $6^m.7, 10''$  6 pr.  
 7 Cent., dup.,  $3^m.1, 3^m.1, 1''.7$

[Bph 15]

7 Virginia, binary,  $5^m.7, 5^m.7, 6''.2$ ,  
 P=328<sup>o</sup>



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Name of Star.	Magni- tude.	Right Ascension.			Annual Variation.	Declination.			An Vari
		h	m	s		°	'	"	
76 Ursæ Majoris . . .	5.9	12	37	51.390	+2.6314	+63	10	46.47	-1
β Crucis . . . . .	1.5	12	42	44.680	3.4823	-59	13	27.68	1
ι Octantis . . . . .	5.4	12	45	55.22*	5.9557	-84	39	43.10	.
31 Comæ . . . . .	5.1	12	47	33.559	2.9240	+28	0	10.80	.
32 H. Camelop. seq. . †	5.3	12	48	29.536	0.4388	+83	52	29.63	.
η Centauri . . . . .	4.3	12	48	43.435	+3.3128	-39	43	0.51	-
ε Ursæ Majoris ( <i>Alioth</i> )	1.7	12	50	17.640	2.6482	+56	25	15.62	.
δ Virginis . . . . .	3.7	12	51	19.267	3.0208	+ 3	51	33.00	.
α Canum Venat. seq. . †	2.9	12	52	3.235	2.8106	+38	46	37.95	.
δ Muscæ . . . . .	3.6	12	56	24.108	4.0726	-71	5	26.22	.
ε Virginis . . . . .	3.0	12	57	56.741	+2.9865	+11	24	56.75	-
θ Virginis . . . . . †	4.4	13	5	32.829	3.1032	- 5	5	7.72	.
43 Comæ . . . . .	4.3	13	7	54.514	2.8025	+28	18	31.63	.
20 Canum Venaticorum .	4.7	13	13	44.057	2.6956	+41	1	11.61	.
γ Hydræ . . . . .	3.3	13	14	17.827	3.2555	-22	43	24.10	.
ι Centauri . . . . .	2.9	13	15	48.741	+3.3616	-36	15	51.30	-
ζ <sup>1</sup> Ursæ Maj.. ( <i>Mizar</i> ) †	2.4	13	20	30.405	2.4221	+55	22	8.38	.
ζ <sup>2</sup> Ursæ Majoris . . .	4.0	Δα + 0.959			. . . .	Δδ - 12.70			.
α Virginis ( <i>Spica</i> ) . .	1.2	13	20	42.776	3.1570	-10	43	4.50	.
Groombridge 2001 . .	6.1	13	23	57.867	1.5243	+72	49	57.36	.
70 Virginis . . . . .	5.2	13	24	16.359	+2.9340	+14	13	56.80	-
κ Octantis . . . . .	5.6	13	26	56.42*	9.0822	-85	21	4.95	.
ζ Virginis . . . . .	3.4	13	30	21.625	3.0545	- 0	9	41.83	.
17 H. Canum Venaticorum	5.0	13	31	0.209	2.6817	+37	37	3.52	.
ε Centauri . . . . .	2.6	13	34	29.567	3.7802	-53	2	5.10	.
m Virginis . . . . .	5.2	13	37	8.910	+3.1452	- 8	16	28.09	-
τ Boötis . . . . .	4.5	13	43	13.369	2.8508	+17	52	47.83	.
η Ursæ Majoris ( <i>Alkaid</i> )	1.9	13	44	11.605	2.3680	+49	44	13.63	.
89 Virginis . . . . .	5.1	13	45	14.978	3.2541	-17	42	40.10	.
ζ Centauri . . . . .	3.1	13	50	13.771	3.7256	-46	52	13.73	.
η Boötis . . . . .	2.8	13	50	38.254	+2.8567	+18	49	24.20	-
θ Apodis . . . . . †	var.	13	57	0.213	5.7399	-76	23	13.79	.
τ Virginis . . . . .	4.3	13	57	19.165	3.0513	+ 1	57	19.56	.
11 Boötis . . . . .	6.1	13	57	19.286	2.7215	+27	47	47.97	.
β Centauri . . . . .	0.9	13	57	48.819	4.2058	-59	57	48.55	.
π Hydræ . . . . .	3.5	14	1	31.624	+3.4094	-26	16	24.30	-
θ Centauri . . . . .	2.3	14	1	40.478	3.5196	-35	57	8.22	.
α Draconis . . . . .	3.6	14	2	5.304	1.6244	+64	46	54.53	.
d Boötis . . . . .	4.8	14	6	31.390	2.7370	+25	29	37.59	.
κ Virginis . . . . .	4.3	14	8	21.561	+3.1968	- 9	52	42.89	.
4 Ursæ Minoris . . . .	5.0	14	9	9.611	-0.2816	+77	56	48.72	-
ι Virginis . . . . .	4.2	14	11	33.307	+3.1424	- 5	35	43.30	.
α Boötis ( <i>Arcturus</i> ) .	0.2	14	11	47.030	2.7355	+19	37	28.04	.
λ Boötis . . . . .	4.3	14	13	9.239	2.2831	+46	28	41.47	.
δ Octantis . . . . .	4.1	14	13	9.28*	9.2466	-83	16	47.50	.
λ Virginis . . . . .	4.6	14	14	30.430	+3.2408	-12	58	49.37	-
2 Libræ . . . . .	6.3	14	18	51.030	3.2237	-11	19	34.81	.
θ Boötis . . . . .	4.1	14	22	18.243	+2.0433	+52	14	35.61	-

32 H. Cam., star 5<sup>m</sup>.8, 21<sup>''</sup>.6 n. pr.  
α Can. Ven., star 5<sup>m</sup>, 19<sup>''</sup>.8 s. pr.

θ Virginis, comp. 9<sup>m</sup>, 7<sup>''</sup>.1 n. pr.  
ζ<sup>1</sup> Urs. Maj., star Alcor 4<sup>m</sup>.0, f. 79<sup>a</sup>.2  
222<sup>''</sup> n.

θ Apodis, var. irreg., 5<sup>m</sup>.5-6<sup>m</sup>.6

[Eph 15]

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1 n	Declination.			Annual Variation.
	°	'	"	
11	+19	36	30.67	-16.279
19	- 1	50	50.69	16.230
17	+76	4	26.15	16.004
15	+30	44	38.50	15.887
12	+38	40	46.56	15.829
19	-41	47	6.06	-15.929
11	+30	6	50.05	15.726
17	-60	29	6.76	14.974
12	+44	46	14.81	15.640
10	-78	41	6.42	15.534
16	- 5	17	21.29	-15.758
13	+27	25	55.12	15.275
2	+ 2	15	1.72	15.280
12	-15	38	39.87	15.088
18	-15	41	21.05	15.080
12	+59	38	20.62	-14.704
16	+74	30	10.25	14.721
15	-11	4	2.22	14.652
17	+14	47	21.14	14.659
11	-42	47	32.73	14.666
13	- 8	10	56.32	-14.409
10	+40	43	31.03	14.292
18	-24	56	54.64	14.278
13	+27	16	42.50	14.138
17	+25	11	58.37	14.136
2	+87	33	38.31	-13.873
7	-51	46	34.94	13.853
12	-19	28	15.06	13.764
17	-68	22	0.14	13.523
10	+ 5	15	15.36	13.485
13	+33	37	52.65	-13.533
18	- 9	4	11.92	13.409
17	+72	8	11.12	12.815
14	+37	40	28.94	12.718
10	+15	43	34.32	12.785
14	+59	15	48.31	-12.671
17	-16	25	15.31	12.695
13	-84	11	5.28	12.569
18	+29	23	53.12	12.515
12	+41	7	20.07	12.364
18	-40	52	55.46	-12.288
4	-14	30	24.03	12.143
14	+27	0	0.25	12.227
16	+36	54	40.29	11.782
10	+ 6	41	32.38	11.449
15	+15	41	13.45	-11.390
15	+18	24	11.83	11.243
14	- 3	10	15.08	-11.151

† Virginis, comp.  $9^m.4^s.5$  s. l.  
 † Boötis, comp.  $5^m.1^s.2$  s. n. pr.

† Libræ, var.  $3^d.33.4^m.8-6^m.2$   
 † Boötis, star  $6^m.7.108''$  s

† Lupi, binary  $5^m.7.5^m.9.6''$  s  
 † Cor Bor., comp.  $6^m.2.6''$  s n. pr.

\* Centauri, dup.,  $0^m.3.1^m.7$ ; companion s. pr. The position given is that of the center of gravity of the system. Corrections given on page 1x remain to be applied to reduce to the position of  $\alpha^1$  Centauri.

[Eph 15]

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Name of Star.	Magni- tude.	Right Ascension.			Annual Variation.	Declination.			An Vari
		h	m	s	s	°	'	"	
12 H. Draconis . . .	5.1	15	45	22.054	+0.9072	+62	51	43.02	-
■ . . . .	3.8	15	46	34.648	+2.9883	+ 4	43	58.75	!
ζ . . . . .	4.3	15	47	4.094	-2.2036	+78	3	23.35	!
β Trianguli Australis . . .	3.0	15	47	38.490	+5.2572	-63	10	10.23	
λ Libræ . . . . .	5.1	15	48	23.796	3.4774	-19	54	50.15	
γ Serpentis . . . . .	3.9	15	52	31.567	+2.7697	+15	56	17.98	-
π Scorpii . . . . .	3.0	15	53	42.394	3.6238	-25	52	13.02	
ε Coronæ Borealis . . . .	4.2	15	54	4.044	2.4823	+27	7	23.97	
δ Scorpii . . . . .	2.5	15	55	18.247	3.5423	-22	22	50.38	
θ Draconis . . . . .	4.1	16	0	17.734	1.1217	+58	47	31.11	
β Scorpii . . . . .	† 2.9	16	0	29.473	+3.4835	-19	34	24.98	-
κ Herculis . . . . .	† 5.3	16	4	14.227	2.7051	+17	16	20.89	
Groombridge 2320 . . . .	5.4	16	6	5.165	0.1528	+68	2	2.01	
φ Herculis . . . . .	4.3	16	6	5.484	1.8898	+45	9	26.16	
δ <sup>1</sup> Apodis . . . . .	4.8	16	7	36.008	8.8535	-78	29	1.45	
δ Ophiuchi . . . . .	3.0	16	9	53.373	+3.2415	- 3	28	34.40	-
σ Coronæ Bor. seq. . . .	† 5.8	16	11	29.697	+2.2458	+34	4	24.81	
19 Ursæ Minoris . . . .	5.5	16	13	13.911	-1.7483	+76	5	31.08	
γ <sup>2</sup> Normæ . . . . .	4.1	16	13	28.249	+4.4721	-49	56	53.18	
ε Ophiuchi . . . . .	3.3	16	13	49.326	3.1718	- 4	29	10.00	
σ Scorpii . . . . .	† 3.1	16	16	1.137	+3.6416	-25	23	23.18	-
τ Herculis . . . . .	3.9	16	17	11.149	1.8031	+46	30	54.78	
γ Herculis . . . . .	3.8	16	18	10.185	+2.6454	+19	21	7.03	
η Ursæ Minoris . . . .	5.0	16	19	58.320	-1.7905	+75	57	5.99	
γ Apodis . . . . .	3.9	16	20	22.413	+9.1024	-78	42	30.41	
ω Herculis . . . . .	4.5	16	21	29.321	+2.7618	+14	13	41.60	-
η Draconis . . . . .	† 2.9	16	22	50.274	0.8078	+61	42	22.83	
α Scorpii . (Antares) †	1.2	16	24	11.574	3.6741	-26	14	39.44	
β Herculis . . . . .	2.8	16	26	33.876	2.5774	+21	40	26.44	
λ Ophiuchi . . . . .	† 3.8	16	26	37.506	+3.0239	+ 2	10	8.98	
A Draconis . . . . .	5.0	16	28	8.583	-0.1297	+68	57	7.41	-
τ Scorpii . . . . .	2.9	16	30	35.282	+3.7296	-28	2	26.34	
σ Herculis . . . . .	4.2	16	31	21.748	1.9335	+42	36	41.87	
ζ Ophiuchi . . . . .	2.7	16	32	28.593	3.3008	-10	23	44.78	
24 Scorpii . . . . .	5.0	16	36	39.286	3.4666	-17	34	42.54	
ζ Herculis . . . . .	† 3.0	16	38	4.895	+2.2614	+31	45	22.12	-
α Trianguli Australis . .	1.9	16	39	39.107	6.3235	-68	52	23.62	
η Herculis . . . . .	3.6	16	39	58.872	2.0558	+39	4	59.66	
Groombridge 2377 . . . .	4.9	16	43	41.071	1.1373	+56	56	0.48	
ε Scorpii . . . . .	2.4	16	44	39.268	3.8797	-34	8	24.25	
49 Herculis . . . . .	6.4	16	48	12.623	+2.7302	+15	6	57.46	-
ε <sup>1</sup> Aræ . . . . .	4.2	16	52	48.206	4.7712	-53	1	52.35	
κ Ophiuchi . . . . .	3.4	16	53	38.638	+2.8382	+ 9	30	22.86	
ε Ursæ Minoris . . . .	4.4	16	54	37.997	-6.2577	+82	10	44.05	
30 Ophiuchi . . . . .	5.0	16	56	34.673	+3.1629	- 4	5	45.47	
ε Herculis . . . . .	3.9	16	57	2.216	+2.2946	+31	3	3.13	-
d Herculis . . . . .	5.3	16	58	27.992	2.2120	+33	41	26.13	
η Ophiuchi . . . . .	† 2.6	17	5	30.075	+3.4375	-15	37	13.99	-

β Scorpii, comp. 5<sup>m</sup>. 1, 13<sup>m</sup>. 3 n. l.  
 ε Herculis, star 6<sup>m</sup>. 5, 29<sup>m</sup>. 7 n. l.  
 σ Cor. Bor., comp. 6<sup>m</sup>. 7, 4<sup>m</sup>. 6 s. pr.

σ Scorpii, star 8<sup>m</sup>, 21<sup>m</sup> pr.  
 γ Draconis, comp. 8<sup>m</sup>, 5<sup>m</sup>. 4 s. l.  
 α Scorpii, comp. 7<sup>m</sup>, 3<sup>m</sup>. 2 pr.

λ Ophiuchi, comp. 6<sup>m</sup>, 1<sup>m</sup>. 2 n.  
 ζ Herculis, binary, 5<sup>m</sup>. 0, 6<sup>m</sup>. 0.  
 η Oph., binary, 5<sup>m</sup>. 2, 5<sup>m</sup>. 7, 6<sup>m</sup>. 1.

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\* Hercules, var. irreg., 3<sup>rd</sup>. 1-3<sup>rd</sup>. 0. dup. |  $\delta$  Hercules, binary, comp. 2<sup>nd</sup>, 13'' |  $\phi$  Draconis, star 6<sup>th</sup>. 1, 30'' .4 m. f.  
comp. 6<sup>th</sup>, 4' .6 s. l. | s. pr. | 70 Ophiuchi, comp. 6<sup>th</sup>, 4' .2 s.

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$\beta$  Lyræ, var., 12<sup>d</sup> 9. 3<sup>m</sup>.4-4<sup>m</sup>.1, star 7<sup>m</sup>.  
 46'' s. l.       $\theta$  Serpentis, star 1<sup>m</sup>.4. 23'' s. l.  
 • Draco., star 7<sup>m</sup>.6, 33'' s. l. m. pr.      R Lyræ, var., 46<sup>d</sup> 4. 4<sup>m</sup> 0-4<sup>m</sup>.7

{  $\zeta$  Sag., binary, 3<sup>m</sup>.4, 3<sup>m</sup>.6, 0''.3  
 {  $\beta$  Cygni, star 5<sup>m</sup>.4. 34''.7 s. l.

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6 Cygni, comp. 9<sup>m</sup>, 1<sup>s</sup>.6 n. pr.  
 7 Aquila, var., 7<sup>m</sup>.18, 3<sup>m</sup>.7-4<sup>m</sup>.4  
 8 Draconis, comp. 7<sup>m</sup>.6, 3<sup>m</sup>.1 n.  
 9 Cygni, star 5<sup>m</sup>.0 pr. 19°, 270' n., star  
 7<sup>m</sup>.11, 1<sup>s</sup>, 96' s.

10 Cephei, comp. 9<sup>m</sup>, 7<sup>s</sup>.5 s. f.  
 11 Capricorn., 11 Capricorn. 4<sup>m</sup>.6 pr. 24°,  
 137' n.  
 12 Capricorn., star 6<sup>m</sup>.2 pr. 14°, 20' s.

13 Capricorn., comp. 9<sup>m</sup>, 3<sup>s</sup>.4 s. f.  
 14 Capricorn., comp. 7<sup>m</sup>.6, 2<sup>s</sup>.8 s.  
 15 Delphini, binary 4<sup>m</sup>.1, 5<sup>m</sup>.4, 0<sup>s</sup>.3  
 16 Delphini, comp. 5<sup>m</sup>.5, 11' s. pr.

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γ Cygni, comp. γ<sup>m</sup>, 0".8  
 ε Cygni, star 6<sup>m</sup>.7 J. 10<sup>d</sup>, 490" S.

β Cephei, star 8<sup>m</sup>, 13".3 S. pr.λ Octantis, binary, 5<sup>m</sup>.5, 8<sup>m</sup>.4 J

[Eph 15]

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Annual Variation.	Declination.			Annual Variation.
s	"	'	"	"
+2.4680	+49	50	42.51	+18.458
3.2851	-21	8	38.83	18.367
1.0648	+75	47	17.92	18.546
3.0832	-0	33	21.30	18.500
2.6880	+38	36	27.07	18.685
+3.3227	-27	29	14.91	+18.702
2.9914	+10	23	14.19	18.738
6.3226	-81	49	39.87	18.761
3.5960	-47	19	46.45	18.737
2.8092	+29	46	34.51	18.770
+2.8869	+23	7	4.97	+18.809
3.6381	-51	45	50.53	18.878
3.1791	-14	2	29.33	18.952
2.8932	+24	9	8.89	18.965
2.1281	+65	45	11.17	18.902
+3.1309	-8	1	55.91	+19.104
4.2154	-70	31	41.31	19.138
3.1863	-16	16	23.30	19.096
3.3209	-30	4	23.03	19.023
2.7546	+41	52	8.08	19.307
+2.9052	+27	37	17.25	+19.490
2.9864	+14	44	51.74	19.335
3.0209	+8	57	0.14	19.411
3.2020	-21	38	2.67	19.510
1.8994	+74	55	40.18	19.443
+3.4071	-45	42	26.60	+19.452
3.0278	+8	15	30.12	19.525
2.8787	+56	41	56.28	19.853
3.1072	-6	30	26.81	19.374
3.1448	-9	33	3.17	19.592
+3.5195	-58	42	8.12	+19.676
3.1094	+2	49	3.66	19.642
3.2449	-32	59	43.05	19.581
2.4517	+67	38	46.70	19.680
2.9658	+23	16	29.52	19.673
+3.1530	-20	33	53.33	+19.628
2.6504	+61	48	57.70	19.747
2.9906	+22	56	9.35	19.788
3.0752	+0	47	24.69	19.686
3.0420	+5	54	43.24	19.753
+3.0321	+12	17	29.41	+19.846
-0.2579	+86	50	19.16	19.867
+3.2247	-38	17	19.13	19.861
2.9709	+30	51	22.14	19.862
2.9282	+45	59	51.23	19.491
+2.9348	+42	47	50.73	+19.916
3.0844	+5	9	55.78	19.496
+2.4387	+77	9	28.64	+20.092

† Decl. var. irreg., 2<sup>nd</sup> s. 2<sup>nd</sup> 7  
 ‡ Cephei, comp. 7<sup>th</sup>, 6<sup>th</sup>, 9<sup>th</sup> f.

† Aquarii, star 8<sup>th</sup> s. 49<sup>th</sup> 4 n. pr.  
 ‡ Cephei, comp. 8<sup>th</sup>, 2<sup>nd</sup> 9 s. pr.

† Pegasi, 6<sup>th</sup> s. 6<sup>th</sup> s. 6<sup>th</sup> 4

[Eph 15]



WASHINGTON, JANUARY 0<sup>d</sup>.732.

Name of Star.	Magni- tude	Right Ascension.			Annual Variation.	Declination.			Annual Variation.
		h	m	s		°	'	"	
κ Andromedæ . . .	4.3	23	36	13.039	+ 2.9474	+43	51	47.31	+19.913
ω <sup>2</sup> Aquarii . . .	4.6	23	38	18.918	3.1127	-15	0	53.55	19.893
ι <sup>1</sup> Aquarii . . .	5.3	23	39	47.668	3.1145	-18	44	55.85	19.962
ψ Andromedæ . . .	5.1	23	41	49.039	2.9637	+45	56	53.64	19.975
41 H. Cephei . . .	5.0	23	43	50.271	2.8495	+67	20	3.92	19.986
δ Sculptoris . . .	4.6	23	44	29.985	+ 3.1278	-28	36	2.61	+19.867
γ <sup>1</sup> Octantis . . .	5.1	23	47	9.199	3.6160	-82	29	28.43	20.002
φ Pegasi . . .	5.2	23	48	9.684	3.0480	+18	38	53.44	19.980
ρ Cassiopeiæ . . .	4.8	23	50	7.747	2.9817	+57	1	35.42	20.028
Groombridge 4163 . .	6.6	23	50	40.703	2.8799	+73	56	14.18	20.024
ω Piscium . . .	4.0	23	54	56.738	+ 3.0795	+ 6	23	34.05	+19.933
ε Tucanæ . . .	4.7	23	55	30.465	3.1392	-66	2	59.09	20.034
30 Piscium . . .	4.7	23	57	36.059	3.0772	- 6	29	11.22	20.007
2 Ceti . . .	4.6	23	59	23.188	+ 3.0752	-17	48	33.28	+20.032

NORTHERN CIRCUMPOLARS.

43 H. Cephei . . .	4.5	0	56	54.030	+ 7.6192	+85	48	6.45	+19.427
α Ursæ Minoris ( <i>Polaris</i> )	2.1	1	29	15.60*	28.5356	+88	51	6.49	18.547
Groombridge 750 . .	6.7	4	9	27.362	17.5817	+85	19	51.71	9.341
Groombridge 944 . .	6.4	5	34	35.250	18.7618	+85	9	25.87	+ 2.214
51 H. Cephei . . .	5.3	7	1	5.64*	29.2318	+87	11	5.45	- 5.315
Groombridge 1119 . .	7.0	8	13	47.916	+60.5580	+88	53	22.50	-11.032
1 H. Draconis . . .	4.6	9	25	4.133	8.8008	+81	42	12.85	15.664
30 H. Camelopardalis .	5.3	10	20	49.679	7.5850	+82	59	30.46	18.189
Bradley 1672 . . .	6.3	12	14	27.688	+ 0.3615	+88	10	15.98	19.947
Groombridge 2283 . .	7.2	15	4	20.10*	-19.5312	+87	33	38.31	13.873
ε Ursæ Minoris . . .	4.4	16	54	37.997	- 6.2577	+82	10	44.05	- 5.641
δ Ursæ Minoris . . .	4.4	17	59	40.30*	19.4981	+86	36	51.19	+ 0.019
λ Ursæ Minoris . . .	6.6	19	5	3.27*	71.5931	+89	0	51.13	5.620
76 Draconis . . .	5.7	20	48	48.820	4.1574	+82	13	2.89	13.491
39 H. Cephei . . .	5.6	23	27	44.653	- 0.2579	+86	50	19.16	+19.867

SOUTHERN CIRCUMPOLARS.

4 Octantis (G.) . . .	5.6	1	42	9.88*	- 3.7794	-85	11	57.70	+18.114
31 Mensæ (G.) . . .	6.2	5	46	38.12*	11.6858	-84	49	49.43	+ 1.255
7 Octantis (G.) . . .	6.4	7	17	0.79*	20.2238	-86	53	53.55	- 6.604
ζ Octantis . . .	5.4	9	9	14.21*	8.1212	-85	19	28.08	14.691
η Octantis . . .	6.3	10	59	56.00*	- 0.3564	-84	8	11.87	19.366
ι Octantis . . .	5.4	12	45	55.22*	+ 5.9557	-84	39	43.10	-19.621
δ Octantis . . .	4.1	14	13	9.28*	9.2466	-83	16	47.50	-16.771
χ Octantis . . .	5.2	18	5	0.43*	35.7348	-87	39	52.55	+ 0.312
σ Octantis . . .	5.5	19	24	31.66*	95.7707	-89	13	43.28	7.226
υ Octantis . . .	5.7	22	15	43.98*	+12.3687	-86	24	3.31	+18.081

[Eph 15]

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
Jan.	h m 0 56	° ' " +85 48	Jan.	h m 1 28	° ' " +88 51	Jan.	h m 4 9	° ' " +85 20	Jan.	h m 5 34	° ' " +85 9	Jan.	h m 7 1	° ' " +87 11
0.3	50.82	31.88	0.3	74.39	32.38	0.4	41.25	11.77	0.5	53.58	38.68	0.5	41.08	9.11
1.3	50.53	32.01	1.3	73.39	32.55	1.4	41.17	12.10	1.5	53.60	39.02	1.5	41.28	9.43
2.3	50.22	32.12	2.3	72.33	32.72	2.4	41.07	12.42	2.5	53.59	39.38	2.5	41.47	9.78
3.3	49.89	32.21	3.3	71.19	32.88	3.4	40.94	12.74	3.4	53.58	39.74	3.5	41.62	10.14
4.3	49.57	32.28	4.3	70.02	33.01	4.4	40.80	13.06	4.4	53.55	40.09	4.5	41.74	10.49
5.2	49.25	32.32	5.3	68.84	33.11	5.4	40.65	13.35	5.4	53.49	40.44	5.5	41.83	10.85
6.2	48.94	32.34	6.3	67.70	33.18	6.4	40.48	13.61	6.4	53.43	40.76	6.5	41.88	11.19
7.2	48.65	32.35	7.3	66.62	33.23	7.4	40.32	13.85	7.4	53.35	41.06	7.5	41.92	11.51
8.2	48.39	32.34	8.3	65.63	33.28	8.4	40.16	14.07	8.4	53.29	41.32	8.5	41.94	11.80
9.2	48.15	32.34	9.3	64.71	33.33	9.4	40.03	14.28	9.4	53.24	41.57	9.5	41.98	12.07
10.2	47.91	32.36	10.3	63.84	33.39	10.4	39.92	14.49	10.4	53.19	41.83	10.5	42.04	12.33
11.2	47.67	32.39	11.3	62.98	33.47	11.4	39.81	14.71	11.4	53.16	42.08	11.5	42.13	12.60
12.2	47.42	32.44	12.3	62.08	33.57	12.4	39.70	14.95	12.4	53.14	42.36	12.5	42.23	12.88
13.2	47.16	32.50	13.3	61.11	33.68	13.4	39.58	15.21	13.4	53.11	42.66	13.5	42.34	13.18
14.2	46.87	32.56	14.2	60.06	33.78	14.4	39.44	15.49	14.4	53.07	42.98	14.5	42.44	13.50
15.2	46.56	32.60	15.2	58.93	33.88	15.4	39.28	15.77	15.4	53.02	43.32	15.5	42.52	13.85
16.2	46.23	32.61	16.2	57.73	33.95	16.4	39.11	16.04	16.4	52.94	43.66	16.5	42.56	14.22
17.2	45.90	32.60	17.2	56.51	33.99	17.4	38.92	16.30	17.4	52.84	43.99	17.5	42.57	14.59
18.2	45.58	32.55	18.2	55.30	34.00	18.3	38.71	16.54	18.4	52.72	44.31	18.5	42.54	14.94
19.2	45.28	32.48	19.2	54.12	33.99	19.3	38.49	16.75	19.4	52.60	44.60	19.5	42.48	15.27
20.2	44.99	32.40	20.2	53.01	33.96	20.3	38.28	16.93	20.4	52.46	44.87	20.5	42.40	15.59
21.2	44.72	32.32	21.2	51.97	33.92	21.3	38.07	17.10	21.4	52.34	45.12	21.5	42.31	15.88
22.2	44.46	32.22	22.2	50.98	33.88	22.3	37.88	17.25	22.4	52.20	45.35	22.5	42.22	16.17
23.2	44.21	32.14	23.2	50.02	33.84	23.3	37.69	17.40	23.4	52.08	45.58	23.5	42.14	16.44
24.2	43.97	32.06	24.2	49.08	33.81	24.3	37.51	17.55	24.4	51.96	45.80	24.5	42.07	16.71
25.2	43.74	32.00	25.2	48.15	33.79	25.3	37.33	17.71	25.4	51.86	46.03	25.4	42.01	16.98
26.2	43.49	31.94	26.2	47.21	33.78	26.3	37.16	17.88	26.4	51.76	46.27	26.4	41.97	17.27
27.2	43.24	31.89	27.2	46.22	33.78	27.3	36.98	18.05	27.4	51.65	46.52	27.4	41.92	17.57
28.2	42.96	31.83	28.2	45.18	33.77	28.3	36.79	18.25	28.4	51.54	46.79	28.4	41.87	17.87
29.2	42.68	31.77	29.2	44.09	33.76	29.3	36.59	18.45	29.4	51.42	47.06	29.4	41.82	18.20
30.2	42.37	31.70	30.2	42.94	33.74	30.3	36.38	18.65	30.4	51.28	47.34	30.4	41.74	18.53
31.2	42.07	31.60	31.2	41.75	33.70	31.3	36.14	18.84	31.4	51.13	47.63	31.4	41.64	18.88
13.68 +13.65			50.24 +50.23			12.30 +12.26			11.86 +11.81			20.38 +20.35		
0 <sup>h</sup> 56 <sup>m</sup> 54 <sup>s</sup> .030			1 <sup>h</sup> 29 <sup>m</sup> 15 <sup>s</sup> .60			4 <sup>h</sup> 9 <sup>m</sup> 27 <sup>s</sup> .362			5 <sup>h</sup> 34 <sup>m</sup> 35 <sup>s</sup> .250			7 <sup>h</sup> 1 <sup>m</sup> 5 <sup>s</sup> .64		
+85° 48' 6".45			+88° 51' 6".49			+85° 19' 51".71			+85° 9' 25".87			+87° 11' 5".45		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
Feb.	h m 0 56	° ' " +85 48	Feb.	h m 1 28	° ' " +88 51	Feb.	h m 4 9	° ' " +85 20	Feb.	h m 5 34	° ' " +85 9	Feb.	h m 7 1	° ' " +87 11
0.2	42.07	31.60	0.2	41.75	33.70	0.3	36.14	18.84	0.4	51.13	47.63	0.4	41.64	18.84
1.2	41.76	31.48	1.2	40.56	33.64	1.3	35.88	19.01	1.4	50.96	47.90	1.4	41.49	19.01
2.2	41.47	31.34	2.2	39.40	33.54	2.3	35.63	19.14	2.4	50.77	48.15	2.4	41.31	19.14
3.2	41.20	31.17	3.2	38.31	33.42	3.3	35.38	19.26	3.4	50.57	48.37	3.4	41.11	19.26
4.2	40.95	30.99	4.2	37.30	33.30	4.3	35.13	19.35	4.4	50.38	48.56	4.4	40.90	19.35
5.2	40.72	30.82	5.2	36.38	33.17	5.3	34.89	19.42	5.4	50.20	48.73	5.4	40.69	19.42
6.2	40.51	30.65	6.2	35.54	33.04	6.3	34.68	19.49	6.4	50.03	48.88	6.4	40.50	19.49
7.2	40.32	30.51	7.2	34.73	32.93	7.3	34.48	19.56	7.4	49.87	49.04	7.4	40.33	19.56
8.2	40.12	30.38	8.2	33.91	32.84	8.3	34.29	19.64	8.3	49.72	49.21	8.4	40.18	19.64
9.2	39.90	30.27	9.2	33.06	32.76	9.3	34.10	19.75	9.3	49.59	49.40	9.4	40.05	19.75
10.2	39.67	30.15	10.2	32.13	32.69	10.3	33.89	19.87	10.3	49.44	49.60	10.4	39.92	19.87
11.1	39.41	30.03	11.2	31.11	32.61	11.3	33.66	20.00	11.3	49.27	49.83	11.4	39.77	20.00
12.1	39.14	29.89	12.2	30.04	32.51	12.3	33.42	20.13	12.3	49.09	50.06	12.4	39.59	20.13
13.1	38.87	29.72	13.2	28.96	32.39	13.3	33.16	20.25	13.3	48.89	50.28	13.4	39.37	20.25
14.1	38.60	29.52	14.2	27.87	32.25	14.3	32.88	20.34	14.3	48.67	50.49	14.4	39.12	20.34
15.1	38.35	29.31	15.2	26.82	32.08	15.3	32.60	20.40	15.3	48.44	50.68	15.4	38.84	20.40
16.1	38.12	29.07	16.2	25.84	31.88	16.3	32.33	20.43	16.3	48.21	50.84	16.4	38.55	20.43
17.1	37.90	28.82	17.2	24.93	31.67	17.3	32.05	20.45	17.3	47.97	50.97	17.4	38.24	20.45
18.1	37.71	28.58	18.2	24.10	31.46	18.3	31.79	20.44	18.3	47.73	51.08	18.4	37.93	20.44
19.1	37.53	28.34	19.1	23.33	31.26	19.3	31.55	20.43	19.3	47.51	51.18	19.4	37.62	20.43
20.1	37.36	28.12	20.1	22.59	31.06	20.3	31.32	20.42	20.3	47.30	51.28	20.4	37.33	20.42
21.1	37.20	27.89	21.1	21.88	30.87	21.3	31.09	20.41	21.3	47.09	51.37	21.4	37.05	20.41
22.1	37.03	27.68	22.1	21.15	30.69	22.3	30.86	20.41	22.3	46.89	51.47	22.4	36.78	20.41
23.1	36.86	27.47	23.1	20.41	30.52	23.2	30.64	20.42	23.3	46.70	51.58	23.4	36.53	20.42
24.1	36.67	27.28	24.1	19.64	30.36	24.2	30.41	20.45	24.3	46.51	51.70	24.4	36.28	20.45
25.1	36.48	27.08	25.1	18.82	30.19	25.2	30.18	20.48	25.3	46.31	51.84	25.4	36.02	20.48
26.1	36.27	26.87	26.1	17.96	30.01	26.2	29.93	20.51	26.3	46.10	51.98	26.4	35.75	20.51
27.1	36.05	26.64	27.1	17.06	29.82	27.2	29.67	20.53	27.3	45.87	52.13	27.4	35.45	20.53
28.1	35.84	26.39	28.1	16.15	29.61	28.2	29.39	20.55	28.3	45.63	52.26	28.4	35.13	20.55
29.1	35.64	26.12	29.1	15.28	29.38	29.2	29.11	20.53	29.3	45.37	52.37	29.4	34.77	20.53
30.1	35.46	25.83	30.1	14.46	29.12	30.2	28.82	20.49	30.3	45.11	52.46	30.3	34.39	20.49
31.1	35.31	25.52	31.1	13.73	28.85	31.2	28.55	20.42	31.3	44.85	52.51	31.3	33.99	20.42
13.68 +13.64			50.21 +50.20			12.31 +12.27			11.86 +11.82			20.40 +20.36		
0 <sup>h</sup> 56 <sup>m</sup> 54 <sup>s</sup> .030			1 <sup>h</sup> 29 <sup>m</sup> 15 <sup>s</sup> .60			4 <sup>h</sup> 9 <sup>m</sup> 27 <sup>s</sup> .362			5 <sup>h</sup> 34 <sup>m</sup> 35 <sup>s</sup> .250			7 <sup>h</sup> 1 <sup>m</sup> 5 <sup>s</sup>		
+85° 48' 6".45			+88° 51' 6".49			+85° 19' 51".71			+85° 9' 25".87			+87° 11' 5"		

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			α Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
Mar.	h m ° ' "	° ' "	Mar.	h m ° ' "	° ' "	Mar.	h m ° ' "	° ' "	Mar.	h m ° ' "	° ' "	Mar.	h m ° ' "	° ' "
	0 56	+85 48		1 28	+88 51		4 9	+85 20		5 34	+85 9		7 1	+87 11
0.1	35.84	26.39	0.1	16.15	29.61	0.2	29.39	20.55	0.3	45.63	52.26	0.4	35.13	25.92
1.1	35.64	26.12	1.1	15.28	29.38	1.2	29.11	20.53	1.3	45.37	52.37	1.4	34.77	26.15
2.1	35.46	25.83	2.1	14.46	29.12	2.2	28.82	20.49	2.3	45.11	52.46	2.3	34.39	26.36
3.1	35.31	25.52	3.1	13.73	28.85	3.2	28.55	20.42	3.3	44.85	52.51	3.3	33.99	26.54
4.1	35.18	25.22	4.1	13.10	28.57	4.2	28.29	20.32	4.3	44.60	52.54	4.3	33.59	26.68
5.1	35.07	24.93	5.1	12.57	28.30	5.2	28.06	20.21	5.3	44.35	52.55	5.3	33.21	26.81
6.1	34.98	24.66	6.1	12.09	28.04	6.2	27.85	20.11	6.3	44.13	52.55	6.3	32.86	26.92
7.1	34.88	24.41	7.1	11.63	27.80	7.2	27.64	20.01	7.3	43.93	52.56	7.3	32.53	27.03
8.1	34.79	24.17	8.1	11.15	27.58	8.2	27.44	19.94	8.3	43.73	52.58	8.3	32.23	27.15
9.1	34.68	23.94	9.1	10.62	27.38	9.2	27.24	19.89	9.3	43.53	52.63	9.3	31.92	27.29
10.1	34.55	23.71	10.1	10.02	27.17	10.2	27.02	19.85	10.3	43.32	52.70	10.3	31.62	27.45
11.1	34.40	23.47	11.1	9.35	26.95	11.2	26.78	19.81	11.3	43.09	52.76	11.3	31.30	27.62
12.1	34.24	23.20	12.1	8.65	26.71	12.2	26.52	19.76	12.3	42.85	52.83	12.3	30.94	27.80
13.1	34.09	22.91	13.1	7.96	26.45	13.2	26.25	19.70	13.3	42.59	52.89	13.3	30.55	27.98
14.1	33.95	22.60	14.1	7.31	26.16	14.2	25.99	19.60	14.3	42.32	52.92	14.3	30.13	28.14
15.1	33.84	22.27	15.1	6.72	25.85	15.2	25.72	19.48	15.3	42.05	52.93	15.3	29.69	28.27
16.1	33.75	21.93	16.1	6.21	25.53	16.2	25.46	19.33	16.3	41.78	52.91	16.3	29.24	28.38
17.1	33.68	21.59	17.1	5.78	25.21	17.2	25.22	19.17	17.2	41.51	52.87	17.3	28.79	28.46
18.1	33.63	21.26	18.1	5.43	24.89	18.2	24.99	19.00	18.2	41.26	52.81	18.3	28.35	28.53
19.0	33.59	20.94	19.1	5.13	24.58	19.2	24.77	18.82	19.2	41.02	52.73	19.3	27.92	28.58
20.0	33.56	20.63	20.1	4.86	24.28	20.2	24.57	18.65	20.2	40.78	52.67	20.3	27.52	28.63
21.0	33.53	20.34	21.1	4.60	24.00	21.2	24.38	18.49	21.2	40.56	52.60	21.3	27.13	28.67
22.0	33.49	20.06	22.1	4.33	23.73	22.2	24.19	18.33	22.2	40.34	52.55	22.3	26.76	28.72
23.0	33.45	19.79	23.1	4.05	23.46	23.2	24.00	18.19	23.2	40.13	52.49	23.3	26.40	28.78
24.0	33.40	19.52	24.1	3.73	23.20	24.2	23.80	18.06	24.2	39.92	52.46	24.3	26.03	28.86
25.0	33.34	19.25	25.1	3.37	22.94	25.2	23.60	17.93	25.2	39.71	52.44	25.3	25.67	28.94
26.0	33.28	18.97	26.1	2.97	22.67	26.2	23.39	17.80	26.2	39.48	52.41	26.3	25.29	29.03
27.0	33.20	18.67	27.0	2.56	22.38	27.2	23.17	17.66	27.2	39.24	52.39	27.3	24.89	29.12
28.0	33.14	18.35	28.0	2.18	22.08	28.2	22.94	17.51	28.2	38.99	52.34	28.3	24.45	29.20
29.0	33.09	18.01	29.0	1.84	21.75	29.2	22.71	17.32	29.2	38.73	52.27	29.3	23.99	29.26
30.0	33.07	17.66	30.0	1.59	21.41	30.2	22.49	17.11	30.2	38.47	52.17	30.3	23.52	29.28
31.0	33.09	17.31	31.0	1.44	21.07	31.2	22.28	16.87	31.2	38.22	52.05	31.3	23.06	29.29
13.67	+13.64		50.14	+50.13		12.31	+12.27		11.86	+11.82		20.41	+20.38	
0 <sup>h</sup> 56 <sup>m</sup>	54 <sup>s</sup> .030		1 <sup>h</sup> 29 <sup>m</sup>	15 <sup>s</sup> .60		4 <sup>h</sup> 9 <sup>m</sup>	27 <sup>s</sup> .362		5 <sup>h</sup> 34 <sup>m</sup>	35 <sup>s</sup> .250		7 <sup>h</sup> 1 <sup>m</sup>	5 <sup>s</sup> .64	
+85° 48'	6''-45		+88° 51'	6''-49		+85° 19'	51''-71		+85° 9'	25''-87		+87° 11'	5''-45	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
Apr.	h m 0 56	° ' " +85 48	Apr.	h m 1 28	° ' " +88 51	Apr.	h m 4 9	° ' " +85 20	Apr.	h m 5 34	° ' " +85 9	Apr.	h m 7 1	° ' " +87 11
0.0	33.09	17.31	0.0	1.44	21.07	0.2	22.28	16.87	0.2	38.22	52.05	0.3	23.06	29.29
1.0	33.12	16.97	1.0	1.38	20.73	1.1	22.09	16.62	1.2	37.98	51.91	1.3	22.61	29.26
2.0	33.17	16.65	2.0	1.42	20.41	2.1	21.93	16.38	2.2	37.76	51.74	2.3	22.18	29.21
3.0	33.24	16.35	3.0	1.50	20.10	3.1	21.79	16.14	3.2	37.57	51.59	3.3	21.79	29.16
4.0	33.30	16.08	4.0	1.56	19.82	4.1	21.66	15.92	4.2	37.39	51.44	4.3	21.42	29.11
5.0	33.35	15.83	5.0	1.59	19.55	5.1	21.53	15.72	5.2	37.21	51.32	5.3	21.07	29.08
6.0	33.38	15.57	6.0	1.56	19.29	6.1	21.39	15.53	6.2	37.02	51.22	6.3	20.72	29.07
6.9	33.38	15.31	7.0	1.46	19.03	7.1	21.23	15.36	7.2	36.83	51.12	7.3	20.36	29.07
7.9	33.38	15.04	8.0	1.31	18.75	8.1	21.07	15.18	8.2	36.63	51.03	8.2	19.99	29.09
8.9	33.38	14.75	9.0	1.16	18.46	9.1	20.88	14.99	9.2	36.41	50.94	9.2	19.58	29.09
9.9	33.40	14.43	10.0	1.03	18.15	10.1	20.70	14.77	10.2	36.18	50.82	10.2	19.14	29.10
10.9	33.42	14.10	11.0	0.96	17.81	11.1	20.51	14.53	11.2	35.95	50.68	11.2	18.68	29.08
11.9	33.47	13.76	12.0	0.98	17.46	12.1	20.34	14.27	12.2	35.71	50.51	12.2	18.22	29.03
12.9	33.55	13.41	13.0	1.08	17.11	13.1	20.17	13.98	13.2	35.48	50.32	13.2	17.76	28.96
13.9	33.64	13.08	14.0	1.26	16.76	14.1	20.03	13.69	14.2	35.28	50.12	14.2	17.31	28.87
14.9	33.75	12.76	14.9	1.49	16.43	15.1	19.90	13.40	15.2	35.08	49.91	15.2	16.88	28.76
15.9	33.88	12.46	15.9	1.77	16.10	16.1	19.79	13.10	16.2	34.89	49.68	16.2	16.47	28.64
16.9	34.00	12.17	16.9	2.07	15.79	17.1	19.69	12.82	17.2	34.72	49.47	17.2	16.07	28.53
17.9	34.12	11.90	17.9	2.36	15.51	18.1	19.59	12.55	18.2	34.56	49.26	18.2	15.71	28.41
18.9	34.23	11.64	18.9	2.64	15.23	19.1	19.51	12.30	19.2	34.41	49.07	19.2	15.36	28.31
19.9	34.34	11.39	19.9	2.89	14.96	20.1	19.42	12.05	20.2	34.25	48.89	20.2	15.02	28.21
20.9	34.44	11.14	20.9	3.10	14.70	21.1	19.33	11.82	21.2	34.10	48.72	21.2	14.68	28.12
21.9	34.53	10.89	21.9	3.27	14.44	22.1	19.23	11.59	22.1	33.94	48.55	22.2	14.32	28.05
22.9	34.61	10.62	22.9	3.43	14.16	23.1	19.12	11.35	23.1	33.77	48.39	23.2	13.95	27.97
23.9	34.69	10.34	23.9	3.59	13.87	24.1	18.99	11.11	24.1	33.59	48.22	24.2	13.57	27.90
24.9	34.79	10.05	24.9	3.77	13.56	25.1	18.87	10.85	25.1	33.40	48.02	25.2	13.17	27.81
25.9	34.91	9.75	25.9	4.03	13.24	26.1	18.76	10.55	26.1	33.21	47.80	26.2	12.75	27.69
26.9	35.05	9.44	26.9	4.40	12.91	27.1	18.66	10.24	27.1	33.03	47.55	27.2	12.33	27.54
27.9	35.22	9.15	27.9	4.87	12.59	28.1	18.58	9.92	28.1	32.87	47.28	28.2	11.93	27.36
28.9	35.42	8.87	28.9	5.42	12.28	29.1	18.53	9.58	29.1	32.73	47.00	29.2	11.55	27.16
29.9	35.63	8.62	29.9	6.03	12.00	30.1	18.50	9.25	30.1	32.60	46.71	30.2	11.20	26.96
30.9	35.83	8.39	30.9	6.64	11.74	31.1	18.48	8.94	31.1	32.50	46.44	31.2	10.89	26.75
13.66 +13.63			50.02 +50.01			12.30 +12.26			11.86 +11.82			20.41 +20.38		
0 <sup>h</sup> 56 <sup>m</sup> 54°.030			1 <sup>h</sup> 29 <sup>m</sup> 15°.60			4 <sup>h</sup> 9 <sup>m</sup> 27°.362			5 <sup>h</sup> 34 <sup>m</sup> 35°.250			7 <sup>h</sup> 1 <sup>m</sup> 5°.64		
+85° 48' 6''.45			+88° 51' 6''.49			+85° 19' 51''.71			+85° 9' 25''.87			+87° 11' 5''.45		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT

~~THE~~ ~~ALLEGED~~ ~~ALLEGED~~

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
June	h m 0 56	° ' " +85 48	June	h m 1 28	° ' " +88 51	June	h m 4 9	° ' " +85 19	June	h m 5 34	° ' " +85 9	June	h m 7 1	° ' " +87 11
0.9	42.82	2.83	0.9	28.49	5.02	0.9	19.25	59.90	1.0	30.56	37.85	1.1	3.12	59.90
1.8	43.05	2.75	1.9	29.26	4.89	1.9	19.34	59.67	2.0	30.57	37.60	2.1	3.00	59.67
2.8	43.29	2.65	2.9	30.03	4.75	2.9	19.41	59.43	3.0	30.56	37.34	3.1	2.84	59.43
3.8	43.53	2.53	3.9	30.82	4.60	3.9	19.49	59.16	4.0	30.55	37.06	4.1	2.67	59.16
4.8	43.79	2.40	4.9	31.66	4.43	4.9	19.56	58.88	5.0	30.53	36.77	5.1	2.49	58.88
5.8	44.07	2.27	5.9	32.58	4.25	5.9	19.65	58.57	6.0	30.52	36.45	6.1	2.30	58.57
6.8	44.37	2.15	6.9	33.57	4.08	6.9	19.75	58.26	7.0	30.52	36.12	7.1	2.12	58.26
7.8	44.68	2.04	7.9	34.62	3.92	7.9	19.88	57.95	8.0	30.54	35.77	8.1	1.96	57.95
8.8	45.01	1.95	8.9	35.72	3.77	8.9	20.02	57.64	9.0	30.57	35.43	9.1	1.84	57.64
9.8	45.33	1.88	9.8	36.85	3.65	9.9	20.17	57.33	10.0	30.61	35.08	10.1	1.74	57.33
10.8	45.66	1.82	10.8	37.97	3.55	10.9	20.33	57.04	11.0	30.67	34.75	11.1	1.66	57.04
11.8	45.98	1.79	11.8	39.08	3.46	11.9	20.50	56.78	12.0	30.75	34.43	12.1	1.61	56.78
12.8	46.29	1.77	12.8	40.15	3.38	12.9	20.67	56.53	13.0	30.84	34.13	13.1	1.58	56.53
13.8	46.59	1.76	13.8	41.17	3.32	13.9	20.84	56.30	14.0	30.92	33.85	14.1	1.56	56.30
14.8	46.87	1.76	14.8	42.15	3.27	14.9	21.01	56.07	15.0	30.99	33.58	15.1	1.54	56.07
15.8	47.13	1.75	15.8	43.08	3.21	15.9	21.17	55.86	15.9	31.07	33.33	16.1	1.51	55.86
16.8	47.39	1.74	16.8	43.99	3.15	16.9	21.31	55.65	16.9	31.14	33.07	17.1	1.47	55.65
17.8	47.66	1.71	17.8	44.89	3.07	17.9	21.44	55.43	17.9	31.20	32.81	18.1	1.42	55.43
18.8	47.94	1.66	18.8	45.82	2.98	18.9	21.58	55.19	18.9	31.25	32.53	19.1	1.35	55.19
19.8	48.23	1.61	19.8	46.82	2.88	19.9	21.72	54.94	19.9	31.30	32.22	20.0	1.27	54.94
20.8	48.54	1.56	20.8	47.90	2.78	20.9	21.88	54.66	20.9	31.36	31.90	21.0	1.20	54.66
21.8	48.87	1.52	21.8	49.07	2.69	21.9	22.06	54.37	21.9	31.44	31.56	22.0	1.14	54.37
22.8	49.23	1.51	22.8	50.30	2.62	22.9	22.27	54.09	22.9	31.55	31.22	23.0	1.12	54.09
23.8	49.59	1.53	23.8	51.57	2.58	23.9	22.49	53.83	23.9	31.68	30.88	24.0	1.15	53.83
24.8	49.94	1.58	24.8	52.84	2.57	24.9	22.73	53.59	24.9	31.83	30.56	25.0	1.21	53.59
25.8	50.28	1.65	25.8	54.06	2.58	25.9	22.98	53.37	25.9	31.98	30.27	26.0	1.30	53.37
26.8	50.60	1.73	26.8	55.21	2.61	26.9	23.22	53.19	26.9	32.14	29.99	27.0	1.40	53.19
27.8	50.89	1.82	27.8	56.27	2.64	27.9	23.44	53.03	27.9	32.29	29.75	28.0	1.51	53.03
28.8	51.16	1.90	28.8	57.25	2.67	28.9	23.65	52.88	28.9	32.43	29.53	29.0	1.60	52.88
29.8	51.43	1.96	29.8	58.22	2.68	29.9	23.84	52.71	29.9	32.56	29.29	30.0	1.68	52.71
30.8	51.69	2.01	30.8	59.18	2.68	30.9	24.03	52.54	30.9	32.68	29.04	31.0	1.72	52.54
31.8	51.97	2.04	31.8	60.17	2.67	31.9	24.21	52.34	31.9	32.78	28.78	32.0	1.74	52.34
13.66 +13.62			49.86 +49.86			12.29 +12.25			11.85 +11.81			20.38 +20.34		
0 <sup>h</sup> 56 <sup>m</sup> 54 <sup>s</sup> .030			1 <sup>h</sup> 29 <sup>m</sup> 15 <sup>s</sup> .60			4 <sup>h</sup> 9 <sup>m</sup> 27 <sup>s</sup> .362			5 <sup>h</sup> 34 <sup>m</sup> 35 <sup>s</sup> .250			7 <sup>h</sup> 1 <sup>m</sup> 5 <sup>s</sup> .140		
+85° 48' 6".45			+88° 51' 6".49			+85° 19' 51".71			+85° 9' 25".87			+87° 11' 5".14		



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

48 H. Cephei. Mag. 4.5			α Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
July	h m	° '	July	h m	° '	July	h m	° '	July	h m	° '	July	h m	° '
	0 56	+85 48		1 28	+88 51		4 9	+85 19		5 34	+85 9		7 1	+87 11
	s	"		s	"		s	"		s	"		s	"
0.8	51.69	2.01	0.8	59.18	2.68	0.9	24.03	52.54	0.9	32.68	29.04	1.0	1.72	10.54
1.8	51.97	2.04	1.8	60.17	2.67	1.9	24.21	52.34	1.9	32.78	28.78	2.0	1.74	10.25
2.8	52.27	2.05	2.8	61.22	2.64	2.9	24.40	52.12	2.9	32.89	28.50	3.0	1.77	9.93
3.8	52.59	2.08	3.8	62.34	2.60	3.9	24.61	51.89	3.9	33.01	28.20	4.0	1.79	9.60
4.8	52.92	2.12	4.8	63.52	2.58	4.9	24.83	51.66	4.9	33.14	27.89	5.0	1.83	9.25
5.8	53.27	2.17	5.8	64.76	2.58	5.9	25.07	51.43	5.9	33.28	27.58	6.0	1.89	8.89
6.7	53.61	2.24	6.8	66.02	2.59	6.9	25.32	51.21	6.9	33.44	27.27	7.0	1.99	8.53
7.7	53.96	2.33	7.8	67.27	2.62	7.9	25.58	51.00	7.9	33.62	26.97	7.9	2.12	8.17
8.7	54.30	2.45	8.8	68.50	2.68	8.9	25.85	50.82	8.9	33.81	26.69	8.9	2.26	7.82
9.7	54.62	2.57	9.8	69.70	2.75	9.9	26.13	50.66	9.9	34.00	26.42	9.9	2.43	7.48
10.7	54.93	2.71	10.8	70.85	2.83	10.9	26.40	50.51	10.9	34.19	26.18	10.9	2.61	7.16
11.7	55.23	2.86	11.8	71.94	2.92	11.9	26.66	50.38	11.9	34.39	25.94	11.9	2.79	6.86
12.7	55.51	3.00	12.8	72.98	3.03	12.9	26.90	50.27	12.9	34.59	25.73	12.9	2.98	6.57
13.7	55.77	3.14	13.8	73.98	3.12	13.9	27.15	50.16	13.9	34.77	25.53	13.9	3.15	6.30
14.7	56.03	3.26	14.8	74.95	3.20	14.9	27.38	50.04	14.9	34.94	25.32	14.9	3.31	6.02
15.7	56.30	3.37	15.7	75.94	3.26	15.9	27.60	49.91	15.9	35.10	25.11	15.9	3.45	5.74
16.7	56.58	3.48	16.7	76.96	3.31	16.9	27.84	49.76	16.9	35.27	24.87	16.9	3.58	5.44
17.7	56.88	3.57	17.7	78.06	3.36	17.9	28.08	49.59	17.9	35.44	24.61	17.9	3.71	5.13
18.7	57.20	3.68	18.7	79.23	3.41	18.9	28.34	49.42	18.9	35.61	24.34	18.9	3.85	4.79
19.7	57.54	3.80	19.7	80.47	3.47	19.8	28.63	49.24	19.9	35.81	24.06	19.9	4.01	4.44
20.7	57.88	3.95	20.7	81.77	3.57	20.8	28.92	49.07	20.9	36.03	23.77	20.9	4.21	4.07
21.7	58.22	4.14	21.7	83.07	3.69	21.8	29.24	48.93	21.9	36.28	23.50	21.9	4.46	3.72
22.7	58.55	4.35	22.7	84.33	3.84	22.8	29.57	48.81	22.9	36.53	23.26	22.9	4.74	3.37
23.7	58.86	4.57	23.7	85.52	4.02	23.8	29.89	48.72	23.9	36.79	23.05	23.9	5.04	3.05
24.7	59.14	4.80	24.7	86.62	4.20	24.8	30.19	48.67	24.9	37.04	22.86	24.9	5.35	2.76
25.7	59.40	5.03	25.7	87.63	4.38	25.8	30.49	48.63	25.9	37.29	22.69	25.9	5.65	2.49
26.7	59.65	5.24	26.7	88.58	4.55	26.8	30.76	48.57	26.9	37.52	22.53	26.9	5.92	2.24
27.7	59.89	5.43	27.7	89.51	4.70	27.8	31.02	48.51	27.9	37.74	22.37	27.9	6.17	1.99
28.7	60.14	5.61	28.7	90.46	4.83	28.8	31.27	48.44	28.9	37.94	22.19	28.9	6.40	1.73
29.7	60.40	5.78	29.7	91.46	4.95	29.8	31.53	48.35	29.9	38.15	21.99	29.9	6.61	1.45
30.7	60.68	5.94	30.7	92.51	5.06	30.8	31.79	48.25	30.9	38.36	21.78	30.9	6.82	1.16
31.7	60.98	6.11	31.7	93.63	5.18	31.8	32.08	48.13	31.9	38.57	21.55	31.9	7.05	0.84
13.66 +13.62			49.86 +49.86			12.28 +12.24			11.84 +11.80			20.36 +20.34		
0 <sup>h</sup> 56 <sup>m</sup> 54 <sup>s</sup> .030			1 <sup>h</sup> 29 <sup>m</sup> 15 <sup>s</sup> .60			4 <sup>h</sup> 9 <sup>m</sup> 27 <sup>s</sup> .362			5 <sup>h</sup> 34 <sup>m</sup> 35 <sup>s</sup> .250			7 <sup>h</sup> 1 <sup>m</sup> 5 <sup>s</sup> .64		
+85° 48' 6".45			+88° 51' 6".49			+85° 19' 51".71			+85° 9' 25".87			+87° 11' 5".45		



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	De nat No
Aug.	h m ° ' "		Aug.	h m ° ' "		Aug.	h m ° ' "		Aug.	h m ° ' "		Aug.	h m ° ' "	
	0 57	+85 48		1 29	+88 51		4 9	+85 19		5 34	+85 9		7 1	+85
0.7	0.98	6.11	0.7	33.63	5.18	0.8	32.08	48.13	0.9	38.57	21.55	0.9	7.05	6
1.7	1.28	6.30	1.7	34.79	5.31	1.8	32.38	48.01	1.9	38.81	21.32	1.9	7.30	6
2.7	1.60	6.50	2.7	35.99	5.46	2.8	32.69	47.91	2.9	39.06	21.09	2.9	7.57	6
3.7	1.90	6.72	3.7	37.18	5.63	3.8	33.01	47.82	3.9	39.32	20.87	3.9	7.87	5
4.7	2.20	6.97	4.7	38.36	5.82	4.8	33.34	47.75	4.9	39.59	20.67	4.9	8.19	5
5.7	2.49	7.22	5.7	39.49	6.02	5.8	33.66	47.70	5.9	39.87	20.48	5.9	8.54	5
6.7	2.77	7.49	6.7	40.57	6.24	6.8	33.98	47.67	6.9	40.16	20.31	6.9	8.90	5
7.7	3.02	7.76	7.7	41.59	6.47	7.8	34.30	47.66	7.9	40.44	20.17	7.9	9.27	5
8.7	3.26	8.04	8.7	42.56	6.71	8.8	34.61	47.66	8.9	40.71	20.04	8.9	9.64	5
9.7	3.48	8.32	9.7	43.47	6.94	9.8	34.91	47.68	9.9	40.98	19.92	9.9	10.00	5
10.7	3.69	8.58	10.7	44.34	7.16	10.8	35.20	47.68	10.8	41.24	19.81	10.9	10.34	5
11.7	3.90	8.83	11.7	45.20	7.37	11.8	35.48	47.69	11.8	41.49	19.69	11.9	10.67	5
12.6	4.13	9.06	12.7	46.08	7.56	12.8	35.75	47.67	12.8	41.73	19.56	12.9	10.97	5
13.6	4.36	9.28	13.7	47.02	7.74	13.8	36.03	47.63	13.8	41.97	19.41	13.9	11.27	5
14.6	4.61	9.51	14.7	48.03	7.92	14.8	36.32	47.58	14.8	42.22	19.24	14.9	11.58	5
15.6	4.88	9.75	15.7	49.11	8.11	15.8	36.63	47.53	15.8	42.49	19.05	15.9	11.91	5
16.6	5.17	10.01	16.7	50.24	8.33	16.8	36.96	47.48	16.8	42.78	18.87	16.9	12.26	5
17.6	5.46	10.29	17.7	51.38	8.57	17.8	37.31	47.45	17.8	43.08	18.69	17.9	12.65	5
18.6	5.73	10.61	18.7	52.49	8.84	18.8	37.67	47.45	18.8	43.40	18.55	18.9	13.07	5
19.6	5.98	10.95	19.7	53.55	9.14	19.8	38.02	47.49	19.8	43.73	18.43	19.9	13.53	5
20.6	6.21	11.29	20.7	54.51	9.44	20.8	38.37	47.55	20.8	44.06	18.33	20.9	14.01	5
21.6	6.41	11.64	21.6	55.36	9.75	21.8	38.70	47.62	21.8	44.37	18.26	21.9	14.47	5
22.6	6.59	11.97	22.6	56.15	10.05	22.8	39.01	47.70	22.8	44.67	18.21	22.9	14.91	5
23.6	6.76	12.29	23.6	56.90	10.33	23.8	39.31	47.78	23.8	44.95	18.16	23.9	15.32	5
24.6	6.94	12.58	24.6	57.66	10.59	24.8	39.60	47.84	24.8	45.21	18.09	24.9	15.71	5
25.6	7.13	12.86	25.6	58.44	10.83	25.7	39.88	47.88	25.8	45.47	18.01	25.9	16.08	5
26.6	7.33	13.13	26.6	59.25	11.07	26.7	40.16	47.91	26.8	45.74	17.91	26.9	16.44	5
27.6	7.54	13.41	27.6	60.13	11.31	27.7	40.45	47.93	27.8	46.01	17.80	27.9	16.82	5
28.6	7.76	13.69	28.6	61.06	11.55	28.7	40.77	47.94	28.8	46.29	17.68	28.9	17.20	5
29.6	8.00	13.99	29.6	62.03	11.81	29.7	41.10	47.96	29.8	46.59	17.55	29.9	17.62	5
30.6	8.23	14.31	30.6	62.99	12.09	30.7	41.43	47.99	30.8	46.90	17.43	30.9	18.05	5
31.6	8.45	14.64	31.6	63.94	12.38	31.7	41.77	48.04	31.8	47.21	17.33	31.9	18.50	5
13.66	+13.63		49.92	+49.91		12.28	+12.24		11.84	+11.80		20.34	+20	
0 <sup>h</sup> 56 <sup>m</sup>	54 <sup>s</sup> .030		1 <sup>h</sup> 29 <sup>m</sup>	15 <sup>s</sup> .60		4 <sup>h</sup> 9 <sup>m</sup>	27 <sup>s</sup> .362		5 <sup>h</sup> 34 <sup>m</sup>	35 <sup>s</sup> .250		7 <sup>h</sup> 1 <sup>m</sup>	5 <sup>s</sup>	
+85° 48'	6'' .45		+88° 51'	6'' .49		+85° 19'	51'' .71		+85° 9'	25'' .87		+87° 11'	5''	

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

48 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Sept.	0 57	+85 48	Sept.	1 30	+88 51	Sept.	4 9	+85 19	Sept.	5 34	+85 9	Sept.	7 1	+87 10
	s	"		s	"		s	"		s	"		s	"
0.6	8.45	14.64	0.6	3.94	12.38	0.7	41.77	48.04	0.8	47.21	17.33	0.9	18.50	52.92
1.6	8.66	14.99	1.6	4.85	12.69	1.7	42.11	48.12	1.8	47.54	17.26	1.8	18.98	52.70
2.6	8.85	15.35	2.6	5.71	13.02	2.7	42.45	48.21	2.8	47.87	17.20	2.8	19.47	52.49
3.6	9.03	15.72	3.6	6.52	13.36	3.7	42.78	48.32	3.8	48.21	17.17	3.8	19.97	52.31
4.6	9.19	16.10	4.6	7.25	13.70	4.7	43.10	48.45	4.8	48.53	17.15	4.8	20.47	52.14
5.6	9.33	16.46	5.6	7.90	14.04	5.7	43.41	48.59	5.8	48.84	17.14	5.8	20.96	52.00
6.6	9.46	16.81	6.6	8.52	14.37	6.7	43.70	48.73	6.8	49.15	17.14	6.8	21.44	51.86
7.6	9.59	17.15	7.6	9.12	14.69	7.7	43.98	48.87	7.8	49.44	17.14	7.8	21.90	51.73
8.6	9.72	17.48	8.6	9.72	14.99	8.7	44.26	48.99	8.8	49.72	17.13	8.8	22.35	51.59
9.6	9.86	17.80	9.6	10.35	15.28	9.7	44.53	49.09	9.8	50.00	17.11	9.8	22.78	51.43
10.6	10.01	18.10	10.6	11.04	15.57	10.7	44.82	49.17	10.8	50.28	17.07	10.8	23.20	51.26
11.6	10.18	18.42	11.6	11.81	15.86	11.7	45.12	49.25	11.8	50.57	17.01	11.8	23.63	51.07
12.6	10.37	18.76	12.6	12.63	16.16	12.7	45.45	49.32	12.8	50.88	16.94	12.8	24.09	50.86
13.6	10.56	19.12	13.6	13.48	16.48	13.7	45.79	49.41	13.8	51.21	16.88	13.8	24.58	50.65
14.6	10.75	19.50	14.6	14.32	16.83	14.7	46.14	49.53	14.8	51.55	16.85	14.8	25.11	50.46
15.6	10.91	19.90	15.6	15.09	17.20	15.7	46.48	49.67	15.8	51.91	16.84	15.8	25.66	50.29
16.6	11.05	20.32	16.6	15.77	17.59	16.7	46.82	49.84	16.7	52.27	16.85	16.8	26.23	50.14
17.6	11.16	20.74	17.6	16.35	17.99	17.7	47.14	50.04	17.7	52.62	16.89	17.8	26.79	50.02
18.6	11.25	21.15	18.6	16.84	18.38	18.7	47.44	50.25	18.7	52.95	16.96	18.8	27.34	49.94
19.6	11.32	21.54	19.6	17.27	18.76	19.7	47.72	50.45	19.7	53.26	17.03	19.8	27.87	49.86
20.6	11.39	21.91	20.6	17.67	19.11	20.7	47.98	50.64	20.7	53.55	17.09	20.8	28.37	49.78
21.6	11.47	22.25	21.6	18.10	19.44	21.7	48.24	50.82	21.7	53.83	17.14	21.8	28.83	49.70
22.6	11.56	22.58	22.6	18.57	19.76	22.7	48.50	50.97	22.7	54.11	17.17	22.8	29.29	49.60
23.6	11.66	22.90	23.6	19.08	20.08	23.7	48.76	51.11	23.7	54.40	17.19	23.8	29.75	49.48
24.6	11.78	23.24	24.6	19.65	20.39	24.7	49.04	51.25	24.7	54.69	17.19	24.8	30.21	49.36
25.6	11.90	23.59	25.6	20.25	20.72	25.7	49.33	51.39	25.7	54.99	17.19	25.8	30.69	49.23
26.6	12.03	23.96	26.6	20.87	21.06	26.7	49.64	51.54	26.7	55.31	17.20	26.8	31.20	49.09
27.5	12.14	24.34	27.5	21.47	21.42	27.7	49.95	51.70	27.7	55.63	17.21	27.8	31.73	48.96
28.5	12.25	24.74	28.5	22.04	21.80	28.7	50.26	51.88	28.7	55.96	17.25	28.8	32.27	48.84
29.5	12.35	25.14	29.5	22.55	22.19	29.7	50.56	52.09	29.7	56.29	17.31	29.8	32.83	48.74
30.5	12.42	25.55	30.5	23.00	22.59	30.7	50.86	52.31	30.7	56.63	17.39	30.8	33.40	48.67
31.5	12.48	25.98	31.5	23.38	23.00	31.6	51.15	52.55	31.7	56.95	17.49	31.8	33.97	48.61
13.67	+13.63		50.03	+50.02		12.28	+12.24		11.84	+11.80		20.33	+20.31	
0 <sup>h</sup> 56 <sup>m</sup>	54 <sup>s</sup> .030		1 <sup>h</sup> 29 <sup>m</sup>	15 <sup>s</sup> .60		4 <sup>h</sup> 9 <sup>m</sup>	27 <sup>s</sup> .362		5 <sup>h</sup> 34 <sup>m</sup>	35 <sup>s</sup> .250		7 <sup>h</sup> 1 <sup>m</sup>	5 <sup>s</sup> .64	
+85° 48'	6''-45		+88° 51'	6''-49		+85° 19'	51''-71		+85° 9'	25''-87		+87° 11'	5''-45	

APPARENT PLACES OF CIRCUMPOLAR STARS  
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48 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
Oct.	h m 0 57 s	° ' " +85 48 "	Oct.	h m 1 30 s	° ' " +88 51 "	Oct.	h m 4 9 s	° ' " +85 19 "	Oct.	h m 5 34 s	° ' " +85 9 "	Oct.	h m 7 1 s	° ' " +87 20 "
0.5	12.42	25.55	0.5	23.00	22.59	0.7	50.86	52.31	0.7	56.63	17.39	0.8	33.40	48.67
1.5	12.48	25.98	1.5	23.38	23.00	1.6	51.15	52.55	1.7	56.95	17.49	1.8	33.97	48.61
2.5	12.51	26.38	2.5	23.69	23.40	2.6	51.43	52.80	2.7	57.27	17.61	2.8	34.54	48.57
3.5	12.53	26.78	3.5	23.95	23.79	3.6	51.69	53.05	3.7	57.57	17.73	3.8	35.08	48.56
4.5	12.54	27.17	4.5	24.17	24.17	4.6	51.93	53.30	4.7	57.87	17.85	4.8	35.61	48.54
5.5	12.56	27.55	5.5	24.38	24.54	5.6	52.17	53.55	5.7	58.16	17.97	5.8	36.12	48.52
6.5	12.58	27.90	6.5	24.60	24.90	6.6	52.41	53.77	6.7	58.43	18.08	6.8	36.60	48.49
7.5	12.61	28.25	7.5	24.87	25.24	7.6	52.64	53.97	7.7	58.71	18.17	7.7	37.07	48.45
8.5	12.67	28.60	8.5	25.21	25.57	8.6	52.89	54.16	8.7	58.99	18.25	8.7	37.55	48.38
9.5	12.73	28.95	9.5	25.61	25.92	9.6	53.15	54.36	9.7	59.28	18.31	9.7	38.05	48.31
10.5	12.81	29.32	10.5	26.04	26.28	10.6	53.43	54.55	10.7	59.59	18.37	10.7	38.57	48.23
11.5	12.88	29.71	11.5	26.47	26.66	11.6	53.72	54.76	11.7	59.92	18.45	11.7	39.13	48.15
12.5	12.94	30.13	12.5	26.86	27.07	12.6	54.02	55.00	12.7	60.26	18.55	12.7	39.71	48.09
13.5	12.96	30.57	13.5	27.17	27.50	13.6	54.30	55.27	13.7	60.60	18.68	13.7	40.31	48.07
14.5	12.97	31.01	14.5	27.38	27.94	14.6	54.58	55.56	14.7	60.92	18.83	14.7	40.92	48.07
15.5	12.95	31.44	15.5	27.49	28.37	15.6	54.83	55.87	15.7	61.24	19.00	15.7	41.51	48.09
16.5	12.90	31.84	16.5	27.51	28.79	16.6	55.06	56.18	16.7	61.53	19.20	16.7	42.08	48.14
17.5	12.85	32.22	17.5	27.49	29.19	17.6	55.27	56.48	17.7	61.80	19.39	17.7	42.61	48.19
18.5	12.80	32.58	18.5	27.47	29.57	18.6	55.46	56.77	18.7	62.06	19.57	18.7	43.10	48.24
19.5	12.77	32.93	19.5	27.47	29.92	19.6	55.66	57.04	19.7	62.31	19.73	19.7	43.58	48.28
20.5	12.74	33.27	20.5	27.54	30.26	20.6	55.86	57.28	20.7	62.57	19.88	20.7	44.05	48.31
21.5	12.73	33.60	21.5	27.65	30.59	21.6	56.06	57.52	21.7	62.82	20.01	21.7	44.53	48.31
22.5	12.73	33.94	22.5	27.81	30.94	22.6	56.28	57.75	22.6	63.08	20.13	22.7	45.01	48.31
23.5	12.74	34.30	23.5	27.98	31.30	23.6	56.51	57.99	23.6	63.36	20.25	23.7	45.51	48.30
24.4	12.73	34.66	24.5	28.15	31.67	24.6	56.74	58.24	24.6	63.66	20.38	24.7	46.04	48.29
25.4	12.73	35.05	25.5	28.29	32.07	25.6	56.98	58.51	25.6	63.94	20.53	25.7	46.58	48.30
26.4	12.71	35.46	26.5	28.37	32.47	26.6	57.21	58.80	26.6	64.24	20.70	26.7	47.14	48.33
27.4	12.66	35.86	27.5	28.39	32.87	27.6	57.43	59.10	27.6	64.53	20.90	27.7	47.70	48.38
28.4	12.61	36.26	28.5	28.34	33.29	28.6	57.65	59.43	28.6	64.82	21.11	28.7	48.25	48.45
29.4	12.53	36.64	29.5	28.22	33.70	29.6	57.85	59.77	29.6	65.09	21.34	29.7	48.80	48.54
30.4	12.43	37.03	30.5	28.03	34.10	30.6	58.03	60.11	30.6	65.35	21.58	30.7	49.34	48.65
31.4	12.32	37.40	31.5	27.80	34.48	31.6	58.20	60.44	31.6	65.60	21.82	31.7	49.86	48.76
13.68 +13.65			50.17 +50.16			12.29 +12.25			11.84 +11.80			20.33 +20.30		
0 <sup>h</sup> 56 <sup>m</sup> 54 <sup>s</sup> .030			1 <sup>h</sup> 20 <sup>m</sup> 15 <sup>s</sup> .60			4 <sup>h</sup> 9 <sup>m</sup> 27 <sup>s</sup> .362			5 <sup>h</sup> 34 <sup>m</sup> 35 <sup>s</sup> .250			7 <sup>h</sup> 1 <sup>m</sup> 5 <sup>s</sup> .64		
+85° 48' 6'' .45			+88° 51' 6'' .49			+85° 19' 51'' .71			+85° 9' 25'' .87			+87° 11' 5'' .45		

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

β H. Cephei. Mag. 4.5		α Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3		
Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.
h m ° ' "	h m ° ' "	Nov.	h m ° ' "	h m ° ' "	Nov.	h m ° ' "	h m ° ' "	Nov.	h m ° ' "	h m ° ' "	Nov.	h m ° ' "	h m ° ' "
0 57 s	+85 48 "		1 30 s	+88 51 "		4 9 s	+85 20 "		5 35 s	+85 9 "		7 1 s	+87 10 "
12.32	37.40	0.5	27.80	34.48	0.6	58.20	0.44	0.6	5.60	21.82	0.7	49.86	48.76
12.21	37.75	1.5	27.54	34.86	1.6	58.35	0.77	1.6	5.84	22.06	1.7	50.35	48.88
12.10	38.08	2.4	27.30	35.21	2.6	58.49	1.08	2.6	6.06	22.28	2.7	50.82	48.99
12.00	38.40	3.4	27.09	35.55	3.6	58.64	1.38	3.6	6.28	22.49	3.7	51.28	49.09
11.92	38.72	4.4	26.93	35.88	4.6	58.79	1.65	4.6	6.50	22.69	4.7	51.72	49.17
11.86	39.04	5.4	26.83	36.21	5.6	58.96	1.92	5.6	6.73	22.87	5.7	52.18	49.24
11.80	39.37	6.4	26.78	36.55	6.5	59.14	2.19	6.6	6.97	23.04	6.7	52.66	49.29
11.75	39.72	7.4	26.75	36.92	7.5	59.33	2.48	7.6	7.23	23.22	7.7	53.16	49.35
11.69	40.10	8.4	26.69	37.31	8.5	59.53	2.78	8.6	7.50	23.42	8.7	53.70	49.42
11.61	40.48	9.4	26.56	37.71	9.5	59.72	3.11	9.6	7.77	23.65	9.7	54.24	49.51
11.51	40.88	10.4	26.35	38.13	10.5	59.91	3.47	10.6	8.05	23.91	10.7	54.80	49.63
11.37	41.27	11.4	26.03	38.54	11.5	60.07	3.84	11.6	8.30	24.19	11.7	55.35	49.78
11.21	41.65	12.4	25.61	38.94	12.5	60.21	4.22	12.6	8.54	24.49	12.7	55.88	49.95
11.04	41.99	13.4	25.13	39.31	13.5	60.33	4.59	13.6	8.75	24.79	13.6	56.36	50.13
10.86	42.31	14.4	24.62	39.65	14.5	60.42	4.94	14.6	8.94	25.08	14.6	56.80	50.32
10.70	42.60	15.4	24.14	39.98	15.5	60.51	5.27	15.6	9.12	25.35	15.6	57.22	50.50
10.54	42.87	16.4	23.70	40.29	16.5	60.60	5.58	16.6	9.29	25.60	16.6	57.62	50.66
10.41	43.15	17.4	23.33	40.58	17.5	60.70	5.88	17.6	9.46	25.83	17.6	58.02	50.81
10.29	43.42	18.4	22.99	40.88	18.5	60.81	6.16	18.6	9.64	26.05	18.6	58.42	50.94
10.17	43.70	19.4	22.69	41.19	19.5	60.92	6.46	19.6	9.83	26.27	19.6	58.84	51.07
10.06	44.00	20.4	22.38	41.51	20.5	61.04	6.76	20.6	10.03	26.50	20.6	59.27	51.19
9.93	44.31	21.4	22.06	41.85	21.5	61.17	7.07	21.6	10.24	26.74	21.6	59.72	51.34
9.80	44.63	22.4	21.69	42.20	22.5	61.28	7.39	22.6	10.45	27.00	22.6	60.18	51.49
9.65	44.96	23.4	21.26	42.55	23.5	61.39	7.74	23.6	10.65	27.28	23.6	60.64	51.66
9.48	45.27	24.4	20.76	42.90	24.5	61.50	8.10	24.6	10.85	27.58	24.6	61.11	51.86
9.28	45.59	25.4	20.19	43.25	25.5	61.59	8.48	25.6	11.03	27.89	25.6	61.56	52.07
9.07	45.90	26.4	19.56	43.60	26.5	61.66	8.85	26.6	11.21	28.21	26.6	62.00	52.31
8.84	46.18	27.4	18.87	43.93	27.5	61.71	9.22	27.6	11.36	28.54	27.6	62.42	52.55
8.62	46.46	28.4	18.15	44.24	28.5	61.74	9.59	28.5	11.50	28.87	28.6	62.81	52.79
8.39	46.71	29.4	17.43	44.53	29.5	61.77	9.94	29.5	11.64	29.18	29.6	63.17	53.03
8.17	46.93	30.4	16.73	44.80	30.5	61.80	10.27	30.5	11.76	29.48	30.6	63.51	53.27
7.97	47.15	31.4	16.08	45.05	31.5	61.82	10.59	31.5	11.87	29.77	31.6	63.83	53.49
+13.66		50.31	+50.30	12.29		+12.25	11.84		+11.80	20.33		+20.31	
54°.030		1 <sup>h</sup> 29 <sup>m</sup>	15°.60	4 <sup>h</sup> 9 <sup>m</sup>		27°.362	5 <sup>h</sup> 34 <sup>m</sup>		35°.250	7 <sup>h</sup> 1 <sup>m</sup>		5°.64	
6''-45		+88° 51'	6''-49	+85° 19'		51''-71	+85° 9'		25''-87	+87° 11'		5''-45	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

43 H. Cephei. Mag. 4.5			$\alpha$ Ursæ Minoris. (Polaris.) Mag. 2.1			Groombridge 750. Mag. 6.7			Groombridge 944. Mag. 6.4			51 H. Cephei. Mag. 5.3	
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.
	h m	° '		h m	° '		h m	° '		h m	° '		h m
Dec.	0 57	+85 48	Dec.	1 29	+88 51	Dec.	4 10	+85 20	Dec.	5 35	+85 9	Dec.	7 2
	s	"		s	"		s	"		s	"		s
0.3	8.17	46.93	0.4	76.73	44.80	0.5	1.80	10.27	0.5	11.76	29.48	0.6	3.51
1.3	7.97	47.15	1.4	76.08	45.05	1.5	1.82	10.59	1.5	11.87	29.77	1.6	3.83
2.3	7.79	47.36	2.4	75.50	45.30	2.5	1.86	10.88	2.5	11.99	30.03	2.6	4.16
3.3	7.63	47.58	3.4	74.99	45.56	3.5	1.91	11.17	3.5	12.12	30.28	3.6	4.51
4.3	7.47	47.82	4.4	74.50	45.84	4.5	1.97	11.47	4.5	12.28	30.54	4.6	4.87
5.3	7.30	48.08	5.4	73.99	46.13	5.5	2.04	11.78	5.5	12.44	30.81	5.6	5.26
6.3	7.13	48.36	6.4	73.44	46.44	6.5	2.12	12.12	6.5	12.61	31.09	6.6	5.67
7.3	6.93	48.65	7.4	72.82	46.76	7.5	2.18	12.48	7.5	12.77	31.41	7.6	6.09
8.3	6.70	48.93	8.4	72.09	47.09	8.5	2.21	12.87	8.5	12.92	31.75	8.6	6.50
9.3	6.45	49.19	9.3	71.27	47.40	9.5	2.23	13.26	9.5	13.05	32.11	9.6	6.89
10.3	6.18	49.43	10.3	70.38	47.69	10.5	2.23	13.64	10.5	13.16	32.47	10.6	7.24
11.3	5.90	49.64	11.3	69.44	47.95	11.5	2.20	14.00	11.5	13.25	32.82	11.6	7.55
12.3	5.63	49.83	12.3	68.52	48.18	12.5	2.17	14.34	12.5	13.32	33.16	12.6	7.83
13.3	5.37	49.99	13.3	67.64	48.39	13.4	2.12	14.66	13.5	13.37	33.47	13.6	8.07
14.3	5.13	50.14	14.3	66.82	48.59	14.4	2.08	14.96	14.5	13.43	33.77	14.6	8.30
15.3	4.91	50.29	15.3	66.05	48.78	15.4	2.05	15.25	15.5	13.49	34.06	15.6	8.54
16.3	4.69	50.43	16.3	65.32	48.97	16.4	2.03	15.53	16.5	13.55	34.34	16.6	8.78
17.3	4.48	50.59	17.3	64.60	49.17	17.4	2.01	15.81	17.5	13.62	34.61	17.6	9.03
18.3	4.27	50.77	18.3	63.88	49.38	18.4	2.00	16.10	18.5	13.70	34.90	18.6	9.30
19.3	4.04	50.95	19.3	63.13	49.60	19.4	1.98	16.41	19.5	13.78	35.20	19.6	9.57
20.3	3.81	51.13	20.3	62.33	49.83	20.4	1.96	16.73	20.5	13.86	35.51	20.5	9.86
21.3	3.56	51.32	21.3	61.47	50.06	21.4	1.93	17.07	21.5	13.93	35.84	21.5	10.14
22.3	3.29	51.50	22.3	60.54	50.29	22.4	1.89	17.41	22.5	13.99	36.18	22.5	10.42
23.3	3.00	51.67	23.3	59.55	50.51	23.4	1.83	17.76	23.5	14.04	36.54	23.5	10.67
24.3	2.70	51.81	24.3	58.52	50.72	24.4	1.76	18.11	24.5	14.08	36.90	24.5	10.90
25.3	2.40	51.94	25.3	57.45	50.91	25.4	1.67	18.44	25.5	14.09	37.26	25.5	11.11
26.3	2.10	52.04	26.3	56.37	51.07	26.4	1.56	18.75	26.5	14.10	37.61	26.5	11.29
27.3	1.80	52.13	27.3	55.31	51.21	27.4	1.45	19.05	27.5	14.09	37.94	27.5	11.43
28.3	1.52	52.20	28.3	54.30	51.33	28.4	1.34	19.33	28.5	14.06	38.25	28.5	11.56
29.3	1.26	52.26	29.3	53.34	51.44	29.4	1.23	19.59	29.5	14.05	38.54	29.5	11.68
30.3	1.02	52.32	30.3	52.46	51.55	30.4	1.14	19.84	30.5	14.04	38.81	30.5	11.80
31.3	0.78	52.40	31.3	51.63	51.67	31.4	1.06	20.08	31.5	14.05	39.07	31.5	11.94
13.70 +13.66			50.42 +50.41			12.30 +12.26			11.85 +11.81			20.34 +2	
0 <sup>h</sup> 56 <sup>m</sup> 54 <sup>s</sup> .030			1 <sup>h</sup> 29 <sup>m</sup> 15 <sup>s</sup> .60			4 <sup>h</sup> 9 <sup>m</sup> 27 <sup>s</sup> .362			5 <sup>h</sup> 34 <sup>m</sup> 35 <sup>s</sup> .250			7 <sup>h</sup> 1 <sup>m</sup>	
+85° 48' 6".45			+88° 51' 6".49			+85° 19' 51".71			+85° 9' 25".87			+87° 11' 5	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2283. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Jan.	8 15	+88 53	Jan.	9 25	+81 42	Jan.	10 21	+82 59	Jan.	12 14	+88 9	Jan.	15 4	+87 33
	s	"		s	"		s	"		s	"		s	"
0.6	16.44	17.96	0.6	15.29	0.76	0.7	0.83	13.18	0.7	46.87	51.52	0.8	5.27	14.17
1.6	17.26	18.23	1.6	15.44	0.92	1.7	1.03	13.27	1.7	47.61	51.45	1.8	5.62	13.87
2.6	18.05	18.53	2.6	15.60	1.10	2.7	1.23	13.38	2.7	48.39	51.40	2.8	6.02	13.58
3.6	18.80	18.84	3.6	15.75	1.31	3.6	1.43	13.52	3.7	49.20	51.37	3.8	6.44	13.31
4.6	19.48	19.15	4.6	15.89	1.54	4.6	1.62	13.68	4.7	50.00	51.37	4.8	6.89	13.06
5.6	20.06	19.48	5.6	16.01	1.77	5.6	1.80	13.85	5.7	50.76	51.39	5.8	7.34	12.83
6.6	20.53	19.79	6.6	16.12	2.01	6.6	1.97	14.03	6.7	51.48	51.42	6.8	7.79	12.62
7.5	20.95	20.09	7.6	16.23	2.24	7.6	2.12	14.21	7.7	52.15	51.47	7.8	8.21	12.44
8.5	21.33	20.37	8.6	16.33	2.45	8.6	2.25	14.38	8.7	52.77	51.51	8.8	8.60	12.27
9.5	21.72	20.62	9.6	16.43	2.64	9.6	2.39	14.52	9.7	53.35	51.53	9.8	8.96	12.10
10.5	22.14	20.87	10.6	16.52	2.81	10.6	2.53	14.64	10.7	53.92	51.55	10.8	9.30	11.93
11.5	22.63	21.10	11.6	16.62	2.98	11.6	2.67	14.75	11.7	54.51	51.55	11.8	9.64	11.73
12.5	23.17	21.34	12.6	16.74	3.15	12.6	2.83	14.87	12.7	55.15	51.54	12.8	9.99	11.52
13.5	23.75	21.62	13.6	16.86	3.34	13.6	3.00	15.00	13.7	55.82	51.53	13.8	10.37	11.29
14.5	24.33	21.91	14.6	16.98	3.55	14.6	3.17	15.16	14.7	56.56	51.53	14.8	10.79	11.06
15.5	24.88	22.23	15.6	17.11	3.79	15.6	3.35	15.33	15.7	57.32	51.55	15.8	11.25	10.83
16.5	25.38	22.57	16.6	17.23	4.05	16.6	3.52	15.53	16.7	58.09	51.60	16.8	11.74	10.62
17.5	25.78	22.91	17.6	17.34	4.33	17.6	3.68	15.76	17.7	58.85	51.68	17.8	12.26	10.44
18.5	26.06	23.27	18.6	17.43	4.62	18.6	3.83	16.00	18.7	59.57	51.79	18.8	12.78	10.29
19.5	26.27	23.61	19.6	17.51	4.91	19.6	3.96	16.24	19.7	60.26	51.91	19.8	13.30	10.16
20.5	26.42	23.94	20.6	17.59	5.19	20.6	4.08	16.49	20.7	60.90	52.04	20.8	13.79	10.05
21.5	26.53	24.25	21.6	17.66	5.46	21.6	4.19	16.72	21.7	61.49	52.17	21.8	14.26	9.96
22.5	26.61	24.54	22.6	17.72	5.72	22.6	4.30	16.94	22.7	62.06	52.30	22.8	14.71	9.87
23.5	26.72	24.82	23.6	17.78	5.96	23.6	4.41	17.16	23.7	62.61	52.41	23.8	15.15	9.77
24.5	26.83	25.10	24.6	17.85	6.20	24.6	4.51	17.37	24.7	63.16	52.52	24.8	15.58	9.68
25.5	26.99	25.38	25.5	17.91	6.43	25.6	4.62	17.57	25.7	63.72	52.62	25.8	16.00	9.57
26.5	27.19	25.67	26.5	17.99	6.67	26.6	4.73	17.77	26.7	64.30	52.71	26.8	16.43	9.45
27.5	27.39	25.96	27.5	18.06	6.91	27.6	4.85	17.97	27.7	64.91	52.81	27.8	16.88	9.33
28.5	27.61	26.27	28.5	18.14	7.17	28.6	4.98	18.19	28.7	65.55	52.91	28.8	17.36	9.20
29.5	27.82	26.60	29.5	18.22	7.44	29.6	5.11	18.43	29.7	66.22	53.02	29.8	17.86	9.07
30.5	27.99	26.95	30.5	18.30	7.74	30.6	5.24	18.69	30.7	66.90	53.15	30.8	18.39	8.95
31.5	28.09	27.30	31.5	18.37	8.06	31.6	5.37	18.96	31.6	67.58	53.31	31.8	18.94	8.85
51.60 +51.59			6.93 +6.86			8.19 +8.13			31.22 +31.20			23.42 +23.40		
8 <sup>h</sup> 13 <sup>m</sup> 47 <sup>s</sup> .916			9 <sup>h</sup> 25 <sup>m</sup> 4 <sup>s</sup> .133			10 <sup>h</sup> 20 <sup>m</sup> 49 <sup>s</sup> .679			12 <sup>h</sup> 14 <sup>m</sup> 27 <sup>s</sup> .688			15 <sup>h</sup> 4 <sup>m</sup> 20 <sup>s</sup> .10		
+88° 53' 22".50			+81° 42' 12".85			+82° 59' 30".46			+88° 10' 15".98			+87° 33' 38".31		



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			80 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2222. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
Feb.	h m	° '	Feb.	h m	° '	Feb.	h m	° '	Feb.	h m	° '	Feb.	h m	° '
	8 15	+88 53		9 25	+81 42		10 21	+82 59		12 15	+88 9		15 4	+87 33
	s	"		s	"		s	"		s	"		s	"
0.5	28.09	27.30	0.5	18.37	8.06	0.6	5.37	18.96	0.6	7.58	53.31	0.8	18.94	8.85
1.5	28.11	27.66	1.5	18.43	8.38	1.6	5.48	19.26	1.6	8.24	53.49	1.8	19.50	8.78
2.5	28.02	28.01	2.5	18.48	8.71	2.6	5.58	19.56	2.6	8.86	53.69	2.8	20.06	8.73
3.5	27.86	28.35	3.5	18.51	9.04	3.6	5.66	19.86	3.6	9.42	53.90	3.8	20.60	8.71
4.5	27.64	28.67	4.5	18.53	9.34	4.6	5.73	20.16	4.6	9.92	54.11	4.8	21.11	8.70
5.5	27.40	28.96	5.5	18.55	9.62	5.6	5.78	20.43	5.6	10.37	54.31	5.8	21.58	8.71
6.5	27.18	29.23	6.5	18.57	9.87	6.6	5.84	20.67	6.6	10.80	54.50	6.8	22.01	8.71
7.5	27.02	29.49	7.5	18.59	10.12	7.6	5.90	20.90	7.6	11.23	54.67	7.7	22.43	8.70
8.5	26.93	29.75	8.5	18.62	10.36	8.5	5.97	21.13	8.6	11.68	54.82	8.7	22.85	8.67
9.5	26.88	30.02	9.5	18.66	10.62	9.5	6.05	21.36	9.6	12.17	54.97	9.7	23.29	8.61
10.5	26.85	30.31	10.5	18.70	10.89	10.5	6.14	21.60	10.6	12.71	55.12	10.7	23.76	8.55
11.5	26.80	30.63	11.5	18.75	11.18	11.5	6.23	21.87	11.6	13.28	55.29	11.7	24.27	8.50
12.4	26.69	30.97	12.5	18.79	11.50	12.5	6.32	22.17	12.6	13.87	55.50	12.7	24.82	8.46
13.4	26.50	31.31	13.5	18.82	11.83	13.5	6.40	22.48	13.6	14.44	55.73	13.7	25.38	8.45
14.4	26.21	31.66	14.5	18.84	12.18	14.5	6.46	22.81	14.6	14.97	55.97	14.7	25.95	8.46
15.4	25.84	32.00	15.5	18.85	12.52	15.5	6.51	23.15	15.6	15.47	56.24	15.7	26.51	8.50
16.4	25.38	32.32	16.5	18.84	12.85	16.5	6.55	23.47	16.6	15.91	56.51	16.7	27.05	8.57
17.4	24.89	32.62	17.5	18.83	13.17	17.5	6.58	23.80	17.6	16.30	56.79	17.7	27.56	8.65
18.4	24.37	32.91	18.5	18.81	13.47	18.5	6.59	24.11	18.6	16.66	57.07	18.7	28.04	8.74
19.4	23.86	33.18	19.5	18.79	13.76	19.5	6.61	24.41	19.6	16.98	57.33	19.7	28.50	8.82
20.4	23.35	33.43	20.5	18.76	14.03	20.5	6.62	24.69	20.6	17.30	57.58	20.7	28.94	8.91
21.4	22.88	33.67	21.5	18.75	14.30	21.5	6.64	24.97	21.6	17.62	57.82	21.7	29.38	8.99
22.4	22.45	33.92	22.5	18.73	14.57	22.5	6.65	25.23	22.6	17.95	58.05	22.7	29.81	9.05
23.4	22.04	34.17	23.5	18.73	14.84	23.5	6.67	25.50	23.6	18.29	58.28	23.7	30.25	9.11
24.4	21.67	34.44	24.5	18.72	15.11	24.5	6.71	25.78	24.6	18.67	58.51	24.7	30.71	9.16
25.4	21.29	34.72	25.5	18.72	15.40	25.5	6.75	26.07	25.6	19.07	58.75	25.7	31.19	9.21
26.4	20.89	35.01	26.5	18.71	15.70	26.5	6.78	26.37	26.6	19.49	59.00	26.7	31.69	9.25
27.4	20.44	35.31	27.5	18.70	16.02	27.5	6.81	26.69	27.6	19.90	59.27	27.7	32.21	9.32
28.4	19.90	35.62	28.5	18.68	16.35	28.5	6.83	27.03	28.6	20.30	59.56	28.7	32.75	9.42
29.4	19.28	35.92	29.5	18.65	16.68	29.5	6.84	27.38	29.6	20.66	59.87	29.7	33.27	9.53
30.4	18.58	36.21	30.4	18.60	17.01	30.5	6.83	27.72	30.6	20.96	60.19	30.7	33.78	9.68
31.4	17.81	36.47	31.4	18.54	17.32	31.5	6.81	28.06	31.6	21.19	60.52	31.7	34.25	9.84
51.72 +51.72			6.93 +6.86			8.19 +8.13			31.24 +31.22			23.42 +23.39		
8 <sup>h</sup> 13 <sup>m</sup> 47 <sup>s</sup> .916			9 <sup>h</sup> 25 <sup>m</sup> 4 <sup>s</sup> .133			10 <sup>h</sup> 20 <sup>m</sup> 49 <sup>s</sup> .679			12 <sup>h</sup> 14 <sup>m</sup> 27 <sup>s</sup> .688			15 <sup>h</sup> 4 <sup>m</sup> 20 <sup>s</sup> .10		
+88° 53' 22".50			+81° 42' 12".85			+82° 59' 30".46			+88° 10' 15".98			+87° 33' 38".31		

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

Greenbridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2283. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
Mar.	h m 8 14	° ' +88 53	Mar.	h m 9 25	° ' +81 42	Mar.	h m 10 21	° ' +82 59	Mar.	h m 12 15	° ' +88 9	Mar.	h m 15 4	° ' +87 33
	s s	" "		s s	" "		s s	" "		s s	" "		s s	" "
0.4	79.90	35.62	0.5	18.68	16.35	0.5	6.83	27.03	0.6	20.30	59.56	0.7	32.75	9.42
1.4	79.28	35.92	1.5	18.65	16.68	1.5	6.84	27.38	1.6	20.66	59.87	1.7	33.27	9.53
2.4	78.58	36.21	2.4	18.60	17.01	2.5	6.83	27.72	2.6	20.96	60.19	2.7	33.78	9.68
3.4	77.81	36.47	3.4	18.54	17.32	3.5	6.81	28.06	3.6	21.19	60.52	3.7	34.25	9.84
4.4	77.00	36.71	4.4	18.48	17.60	4.5	6.77	28.37	4.6	21.37	60.84	4.7	34.67	10.02
5.4	76.22	36.92	5.4	18.42	17.86	5.5	6.74	28.66	5.6	21.52	61.14	5.7	35.06	10.20
6.4	75.48	37.11	6.4	18.36	18.10	6.5	6.69	28.93	6.6	21.64	61.41	6.7	35.43	10.36
7.4	74.80	37.29	7.4	18.30	18.32	7.5	6.66	29.18	7.6	21.77	61.67	7.7	35.78	10.51
8.4	74.19	37.48	8.4	18.26	18.55	8.5	6.64	29.43	8.6	21.95	61.92	8.7	36.15	10.63
9.4	73.62	37.69	9.4	18.22	18.79	9.5	6.63	29.69	9.5	22.16	62.17	9.7	36.54	10.75
10.4	73.06	37.91	10.4	18.18	19.05	10.5	6.62	29.96	10.5	22.41	62.43	10.7	36.95	10.87
11.4	72.44	38.16	11.4	18.14	19.33	11.5	6.61	30.26	11.5	22.67	62.70	11.7	37.39	10.99
12.4	71.76	38.41	12.4	18.10	19.63	12.5	6.60	30.58	12.5	22.93	63.00	12.7	37.86	11.14
13.4	71.00	38.67	13.4	18.04	19.93	13.5	6.57	30.91	13.5	23.16	63.32	13.7	38.34	11.31
14.4	70.15	38.92	14.4	17.97	20.24	14.5	6.53	31.24	14.5	23.35	63.66	14.7	38.80	11.50
15.4	69.23	39.15	15.4	17.89	20.54	15.5	6.47	31.58	15.5	23.49	64.01	15.6	39.24	11.72
16.4	68.26	39.35	16.4	17.80	20.81	16.5	6.41	31.90	16.5	23.57	64.36	16.6	39.65	11.95
17.4	67.26	39.54	17.4	17.70	21.07	17.4	6.33	32.21	17.5	23.59	64.71	17.6	40.03	12.20
18.4	66.28	39.71	18.4	17.60	21.31	18.4	6.25	32.50	18.5	23.60	65.04	18.6	40.38	12.45
19.4	65.31	39.86	19.4	17.51	21.53	19.4	6.17	32.77	19.5	23.58	65.36	19.6	40.71	12.69
20.4	64.37	39.99	20.4	17.42	21.74	20.4	6.09	33.02	20.5	23.56	65.66	20.6	41.02	12.92
21.3	63.48	40.13	21.4	17.33	21.95	21.4	6.01	33.27	21.5	23.54	65.95	21.6	41.32	13.14
22.3	62.63	40.26	22.4	17.25	22.15	22.4	5.94	33.52	22.5	23.54	66.23	22.6	41.62	13.35
23.3	61.81	40.40	23.4	17.17	22.35	23.4	5.88	33.76	23.5	23.55	66.51	23.6	41.93	13.55
24.3	60.99	40.56	24.4	17.09	22.57	24.4	5.82	34.02	24.5	23.60	66.79	24.6	42.25	13.74
25.3	60.20	40.73	25.4	17.02	22.80	25.4	5.76	34.28	25.5	23.67	67.07	25.6	42.59	13.94
26.3	59.36	40.90	26.4	16.94	23.04	26.4	5.71	34.55	26.5	23.73	67.37	26.6	42.95	14.14
27.3	58.46	41.09	27.4	16.85	23.30	27.4	5.65	34.84	27.5	23.78	67.69	27.6	43.32	14.37
28.3	57.51	41.27	28.4	16.76	23.55	28.4	5.57	35.14	28.5	23.81	68.02	28.6	43.68	14.61
29.3	56.45	41.43	29.4	16.65	23.79	29.4	5.48	35.43	29.5	23.78	68.37	29.6	44.02	14.88
30.3	55.35	41.56	30.4	16.54	24.01	30.4	5.38	35.71	30.5	23.69	68.72	30.6	44.34	15.17
31.3	54.21	41.67	31.4	16.42	24.22	31.4	5.25	35.98	31.5	23.53	69.06	31.6	44.61	15.48
51.82	+51.81	6.93	+6.86	8.20	+8.13	31.28	+31.26	23.42	+23.40					
8 <sup>h</sup> 13 <sup>m</sup>	47° 9.16	9 <sup>h</sup> 25 <sup>m</sup>	4° 1.33	10 <sup>h</sup> 20 <sup>m</sup>	49° 6.79	12 <sup>h</sup> 14 <sup>m</sup>	27° 6.88	15 <sup>h</sup> 4 <sup>m</sup>	20° 10					
+88° 53'	22'' .50	+81° 42'	12'' .85	+82° 59'	30'' .46	+88° 10'	15'' .98	+87° 33'	38'' .31					



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge Mag. 7.	
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.
Apr.	h m 8 14	° ' +88 53	Apr.	h m 9 25	° ' +81 42	Apr.	h m 10 21	° ' +82 59	Apr.	h m 12 15	° ' +88 10	Apr.	h m 15 4
	s s	"		s s	"		s s	"		s s	"		s s
0.3	54.21	41.67	0.4	16.42	24.22	0.4	5.25	35.98	0.5	23.53	9.06	0.6	44.61
1.3	53.08	41.75	1.4	16.29	24.39	1.4	5.13	36.22	1.5	23.34	9.39	1.6	44.84
2.3	51.98	41.80	2.4	16.16	24.54	2.4	5.00	36.43	2.5	23.11	9.69	2.6	45.02
3.3	50.97	41.83	3.4	16.05	24.67	3.4	4.88	36.62	3.5	22.88	9.97	3.6	45.19
4.3	50.02	41.88	4.4	15.94	24.80	4.4	4.77	36.80	4.5	22.68	10.22	4.6	45.36
5.3	49.15	41.93	5.4	15.84	24.93	5.4	4.68	36.98	5.5	22.53	10.47	5.6	45.54
6.3	48.29	42.00	6.4	15.75	25.07	6.4	4.59	37.18	6.5	22.41	10.72	6.6	45.74
7.3	47.41	42.10	7.4	15.66	25.24	7.4	4.50	37.39	7.5	22.32	10.99	7.6	45.98
8.3	46.50	42.20	8.3	15.56	25.42	8.4	4.42	37.63	8.5	22.24	11.28	8.6	46.24
9.3	45.51	42.31	9.3	15.45	25.61	9.4	4.32	37.87	9.5	22.13	11.59	9.6	46.51
10.3	44.45	42.41	10.3	15.33	25.81	10.4	4.21	38.12	10.5	21.99	11.91	10.6	46.77
11.3	43.30	42.50	11.3	15.21	25.99	11.4	4.09	38.37	11.5	21.80	12.24	11.6	47.01
12.3	42.13	42.56	12.3	15.07	26.16	12.4	3.95	38.60	12.5	21.55	12.57	12.6	47.21
13.3	40.93	42.60	13.3	14.94	26.31	13.4	3.80	38.82	13.5	21.25	12.89	13.6	47.38
14.3	39.72	42.62	14.3	14.79	26.43	14.4	3.65	39.02	14.5	20.92	13.20	14.6	47.53
15.3	38.56	42.61	15.3	14.65	26.54	15.4	3.50	39.20	15.4	20.56	13.49	15.6	47.64
16.3	37.43	42.60	16.3	14.51	26.63	16.4	3.35	39.36	16.4	20.20	13.77	16.6	47.73
17.3	36.35	42.57	17.3	14.38	26.71	17.4	3.21	39.51	17.4	19.84	14.03	17.6	47.80
18.3	35.34	42.55	18.3	14.25	26.79	18.4	3.08	39.65	18.4	19.49	14.28	18.6	47.87
19.3	34.36	42.53	19.3	14.12	26.86	19.4	2.94	39.79	19.4	19.17	14.51	19.6	47.94
20.3	33.41	42.52	20.3	14.01	26.94	20.4	2.82	39.93	20.4	18.87	14.75	20.6	48.03
21.3	32.48	42.51	21.3	13.90	27.03	21.4	2.70	40.08	21.4	18.60	14.98	21.5	48.13
22.3	31.53	42.52	22.3	13.78	27.12	22.3	2.58	40.24	22.4	18.34	15.23	22.5	48.25
23.3	30.56	42.54	23.3	13.67	27.23	23.3	2.46	40.40	23.4	18.07	15.49	23.5	48.38
24.3	29.53	42.55	24.3	13.55	27.34	24.3	2.34	40.58	24.4	17.78	15.76	24.5	48.51
25.3	28.43	42.55	25.3	13.41	27.45	25.3	2.19	40.76	25.4	17.45	16.04	25.5	48.62
26.2	27.28	42.54	26.3	13.27	27.55	26.3	2.03	40.93	26.4	17.07	16.33	26.5	48.70
27.2	26.08	42.49	27.3	13.12	27.62	27.3	1.86	41.08	27.4	16.63	16.61	27.5	48.75
28.2	24.91	42.42	28.3	12.97	27.66	28.3	1.69	41.20	28.4	16.13	16.87	28.5	48.74
29.2	23.77	42.32	29.3	12.82	27.67	29.3	1.52	41.29	29.4	15.60	17.10	29.5	48.60
30.2	22.70	42.20	30.3	12.67	27.66	30.3	1.35	41.36	30.4	15.07	17.31	30.5	48.62
31.2	21.72	42.07	31.3	12.54	27.64	31.3	1.19	41.41	31.4	14.55	17.49	31.5	48.54
51.86 +51.85			6.93 +6.86			8.20 +8.14			31.32 +31.30			23.44	
8 <sup>h</sup> 13 <sup>m</sup> 47 <sup>s</sup> .916			9 <sup>h</sup> 25 <sup>m</sup> 4 <sup>s</sup> .133			10 <sup>h</sup> 20 <sup>m</sup> 49 <sup>s</sup> .679			12 <sup>h</sup> 14 <sup>m</sup> 27 <sup>s</sup> .688			15 <sup>h</sup> 4 <sup>m</sup>	
+88° 53' 22".50			+81° 42' 12".85			+82° 59' 30".46			+88° 10' 15".98			+87° 33'	

## APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2283. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
May	8 13	+88 53	May	9 25	+81 42	May	10 20	+82 59	May	12 14	+88 10	May	15 4	+87 33
	s	"		s	"		s	"		s	"		s	"
0.2	82.70	42.20	0.3	12.67	27.66	0.3	61.35	41.36	0.4	75.07	17.31	0.5	48.62	24.40
1.2	81.72	42.07	1.3	12.54	27.64	1.3	61.19	41.41	1.4	74.55	17.49	1.5	48.54	24.71
2.2	80.83	41.95	2.3	12.41	27.62	2.3	61.04	41.45	2.4	74.09	17.66	2.5	48.45	24.99
3.2	79.98	41.84	3.3	12.29	27.60	3.3	60.91	41.50	3.4	73.66	17.83	3.5	48.38	25.26
4.2	79.15	41.76	4.3	12.18	27.61	4.3	60.78	41.57	4.4	73.27	18.00	4.5	48.36	25.51
5.2	78.30	41.70	5.3	12.07	27.64	5.3	60.65	41.66	5.4	72.90	18.19	5.5	48.36	25.78
6.2	77.39	41.64	6.3	11.95	27.67	6.3	60.52	41.76	6.4	72.52	18.39	6.5	48.37	26.06
7.2	76.41	41.58	7.3	11.83	27.72	7.3	60.38	41.87	7.4	72.12	18.62	7.5	48.39	26.36
8.2	75.36	41.51	8.3	11.70	27.76	8.3	60.22	41.98	8.4	71.67	18.85	8.5	48.38	26.69
9.2	74.25	41.42	9.3	11.55	27.78	9.3	60.06	42.08	9.4	71.17	19.09	9.5	48.35	27.03
10.2	73.15	41.31	10.3	11.40	27.79	10.3	59.88	42.16	10.4	70.62	19.31	10.5	48.29	27.37
11.2	72.04	41.17	11.3	11.24	27.77	11.3	59.69	42.23	11.4	70.04	19.53	11.5	48.19	27.73
12.2	70.97	41.02	12.3	11.10	27.72	12.3	59.51	42.27	12.4	69.43	19.72	12.5	48.06	28.07
13.2	69.95	40.85	13.3	10.95	27.66	13.3	59.33	42.28	13.4	68.81	19.90	13.5	47.90	28.40
14.2	68.98	40.67	14.2	10.81	27.59	14.3	59.16	42.28	14.4	68.20	20.06	14.5	47.72	28.71
15.2	68.07	40.49	15.2	10.68	27.51	15.3	58.99	42.28	15.4	67.60	20.20	15.5	47.54	29.01
16.2	67.23	40.30	16.2	10.55	27.44	16.3	58.83	42.27	16.4	67.02	20.33	16.5	47.36	29.29
17.2	66.43	40.13	17.2	10.44	27.36	17.3	58.68	42.26	17.4	66.48	20.45	17.5	47.18	29.56
18.2	65.66	39.98	18.2	10.32	27.28	18.3	58.54	42.26	18.4	65.97	20.56	18.5	47.02	29.82
19.2	64.89	39.83	19.2	10.21	27.22	19.3	58.40	42.26	19.4	65.48	20.68	19.5	46.89	30.08
20.2	64.11	39.68	20.2	10.11	27.18	20.3	58.27	42.28	20.4	65.00	20.82	20.5	46.76	30.34
21.2	63.30	39.55	21.2	9.99	27.14	21.3	58.12	42.30	21.3	64.51	20.96	21.5	46.64	30.61
22.2	62.42	39.40	22.2	9.86	27.09	22.3	57.97	42.32	22.3	63.98	21.11	22.5	46.51	30.90
23.2	61.50	39.25	23.2	9.73	27.04	23.3	57.81	42.34	23.3	63.40	21.27	23.5	46.37	31.21
24.2	60.55	39.07	24.2	9.60	26.97	24.3	57.64	42.35	24.3	62.78	21.43	24.5	46.19	31.52
25.2	59.60	38.86	25.2	9.46	26.87	25.3	57.46	42.33	25.3	62.11	21.57	25.5	45.96	31.85
26.2	58.67	38.62	26.2	9.32	26.74	26.3	57.27	42.27	26.3	61.40	21.68	26.5	45.68	32.17
27.2	57.81	38.36	27.2	9.18	26.58	27.3	57.09	42.19	27.3	60.67	21.76	27.5	45.37	32.47
28.2	57.06	38.09	28.2	9.06	26.41	28.3	56.92	42.10	28.3	59.96	21.82	28.4	45.04	32.74
29.2	56.39	37.82	29.2	8.94	26.24	29.2	56.77	41.99	29.3	59.29	21.86	29.4	44.71	32.98
30.2	55.80	37.58	30.2	8.84	26.07	30.2	56.63	41.88	30.3	58.67	21.89	30.4	44.40	33.21
31.2	55.27	37.34	31.2	8.74	25.91	31.2	56.50	41.78	31.3	58.10	21.92	31.4	44.11	33.42
51.84	+51.83		6.93	+6.86		8.20	+8.14		31.35	+31.34		23.47	+23.45	
8 <sup>h</sup> 13 <sup>m</sup>	47 <sup>s</sup> .916		9 <sup>h</sup> 25 <sup>m</sup>	4 <sup>s</sup> .133		10 <sup>h</sup> 20 <sup>m</sup>	49 <sup>s</sup> .679		12 <sup>h</sup> 14 <sup>m</sup>	27 <sup>s</sup> .688		15 <sup>h</sup> 4 <sup>m</sup>	20 <sup>s</sup> .10	
+88° 53'	22''.50		+81° 42'	12''.85		+82° 59'	30''.46		+88° 10'	15''.98		+87° 33'	38''.31	

[Eph 15]

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			80 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge Mag. 7.	
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.
June	h m	° '	June	h m	° '	June	h m	° '	June	h m	° '	June	h m
	8 13	+88 53		9 25	+81 42		10 20	+82 59		12 14	+88 10		15 4
	s	"		s	"		s	"		s	"		s
0.2	55.27	37.34	0.2	8.74	25.91	0.2	56.50	41.78	0.3	58.10	21.92	0.4	44.11
1.2	54.73	37.13	1.2	8.64	25.78	1.2	56.37	41.70	1.3	57.56	21.95	1.4	43.86
2.1	54.14	36.93	2.2	8.55	25.66	2.2	56.24	41.64	2.3	57.03	22.01	2.4	43.64
3.1	53.50	36.73	3.2	8.46	25.55	3.2	56.11	41.59	3.3	56.49	22.09	3.4	43.42
4.1	52.80	36.53	4.2	8.35	25.44	4.2	55.97	41.54	4.3	55.91	22.17	4.4	43.18
5.1	52.04	36.32	5.2	8.23	25.32	5.2	55.81	41.49	5.3	55.29	22.26	5.4	42.93
6.1	51.26	36.09	6.2	8.10	25.18	6.2	55.65	41.42	6.3	54.63	22.35	6.4	42.65
7.1	50.48	35.84	7.2	7.97	25.02	7.2	55.47	41.34	7.3	53.92	22.42	7.4	42.33
8.1	49.72	35.56	8.2	7.85	24.84	8.2	55.30	41.24	8.3	53.19	22.48	8.4	41.99
9.1	49.03	35.27	9.2	7.74	24.65	9.2	55.14	41.11	9.3	52.45	22.51	9.4	41.61
10.1	48.39	34.96	10.2	7.62	24.44	10.2	54.97	40.96	10.3	51.73	22.52	10.4	41.22
11.1	47.82	34.66	11.2	7.52	24.22	11.2	54.81	40.80	11.3	51.02	22.52	11.4	40.82
12.1	47.33	34.36	12.2	7.42	23.99	12.2	54.67	40.63	12.3	50.33	22.50	12.4	40.41
13.1	46.87	34.06	13.2	7.33	23.77	13.2	54.54	40.47	13.3	49.67	22.47	13.4	40.02
14.1	46.48	33.78	14.2	7.25	23.56	14.2	54.42	40.31	14.3	49.05	22.44	14.4	39.65
15.1	46.10	33.52	15.2	7.17	23.36	15.2	54.30	40.16	15.3	48.46	22.41	15.4	39.29
16.1	45.72	33.26	16.2	7.10	23.17	16.2	54.18	40.02	16.3	47.89	22.38	16.4	38.95
17.1	45.32	33.02	17.2	7.02	22.99	17.2	54.06	39.88	17.3	47.31	22.36	17.4	38.62
18.1	44.87	32.77	18.2	6.94	22.82	18.2	53.94	39.76	18.3	46.73	22.36	18.4	38.30
19.1	44.37	32.52	19.2	6.85	22.64	19.2	53.81	39.64	19.3	46.11	22.37	19.4	37.97
20.1	43.84	32.24	20.1	6.74	22.44	20.2	53.67	39.50	20.3	45.45	22.38	20.4	37.60
21.1	43.29	31.94	21.1	6.64	22.22	21.2	53.52	39.34	21.3	44.73	22.37	21.4	37.19
22.1	42.77	31.62	22.1	6.54	21.98	22.2	53.36	39.16	22.3	43.98	22.35	22.4	36.74
23.1	42.30	31.27	23.1	6.44	21.71	23.2	53.21	38.95	23.3	43.21	22.29	23.4	36.25
24.1	41.94	30.90	24.1	6.35	21.42	24.2	53.06	38.71	24.3	42.45	22.20	24.4	35.74
25.1	41.67	30.54	25.1	6.27	21.12	25.2	52.93	38.46	25.3	41.72	22.09	25.4	35.23
26.1	41.51	30.19	26.1	6.22	20.82	26.2	52.82	38.20	26.2	41.04	21.96	26.4	34.72
27.1	41.41	29.86	27.1	6.17	20.54	27.2	52.72	37.96	27.2	40.43	21.83	27.4	34.24
28.1	41.31	29.55	28.1	6.12	20.27	28.2	52.63	37.74	28.2	39.85	21.71	28.4	33.80
29.1	41.21	29.26	29.1	6.08	20.03	29.2	52.54	37.53	29.2	39.30	21.60	29.4	33.39
30.1	41.04	28.98	30.1	6.02	19.79	30.2	52.44	37.33	30.2	38.74	21.50	30.4	32.99
31.1	40.84	28.71	31.1	5.97	19.57	31.2	52.34	37.15	31.2	38.17	21.43	31.4	32.59
51.74	+51.74		6.93	+6.86		8.20	+8.14		31.36	+31.35		23.49	
8 <sup>h</sup> 13 <sup>m</sup>	47° 9' 16"		9 <sup>h</sup> 25 <sup>m</sup>	4° 13' 33"		10 <sup>h</sup> 20 <sup>m</sup>	49° 6' 79"		12 <sup>h</sup> 14 <sup>m</sup>	27° 6' 88"		15 <sup>h</sup> 4 <sup>m</sup>	
+88° 53'	22'' 50		+81° 42'	12'' 85		+82° 59'	30'' 46		+88° 10'	15'' 98		+87° 33'	3

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			80 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2283. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
July	h m 8 13	° ' +88 53	July	h m 9 25	° ' +81 42	July	h m 10 20	° ' +82 59	July	h m 12 14	° ' +88 10	July	h m 15 4	° ' +87 33
	s	"		s	"		s	"		s	"		s	"
1.1	40.84	28.71	1.1	5.97	19.57	1.2	52.34	37.15	1.2	38.17	21.43	1.4	32.59	39.68
2.1	40.56	28.43	2.1	5.90	19.34	2.2	52.23	36.06	2.2	37.57	21.37	2.4	32.19	39.83
3.1	40.25	28.12	3.1	5.83	19.10	3.2	52.11	36.77	3.2	36.92	21.30	3.3	31.76	39.99
4.1	39.94	27.80	4.1	5.75	18.84	4.1	51.98	36.56	4.2	36.23	21.22	4.3	31.29	40.16
5.1	39.63	27.45	5.1	5.67	18.56	5.1	51.85	36.33	5.2	35.52	21.13	5.3	30.80	40.33
6.1	39.38	27.10	6.1	5.60	18.25	6.1	51.72	36.07	6.2	34.80	21.02	6.3	30.27	40.49
7.1	39.20	26.73	7.1	5.53	17.94	7.1	51.60	35.80	7.2	34.08	20.89	7.3	29.73	40.62
8.0	39.08	26.37	8.1	5.48	17.61	8.1	51.49	35.52	8.2	33.38	20.73	8.3	29.19	40.74
9.0	39.05	26.00	9.1	5.43	17.29	9.1	51.39	35.23	9.2	32.71	20.57	9.3	28.64	40.84
10.0	39.07	25.64	10.1	5.39	16.97	10.1	51.30	34.94	10.2	32.08	20.39	10.3	28.11	40.92
11.0	39.14	25.30	11.1	5.37	16.66	11.1	51.22	34.66	11.2	31.49	20.20	11.3	27.59	40.98
12.0	39.25	24.96	12.1	5.34	16.36	12.1	51.15	34.38	12.2	30.93	20.01	12.3	27.09	41.03
13.0	39.37	24.65	13.1	5.32	16.07	13.1	51.09	34.12	13.2	30.40	19.84	13.3	26.61	41.07
14.0	39.47	24.35	14.1	5.30	15.79	14.1	51.02	33.86	14.2	29.88	19.67	14.3	26.15	41.12
15.0	39.53	24.05	15.1	5.28	15.52	15.1	50.95	33.61	15.2	29.36	19.52	15.3	25.69	41.18
16.0	39.54	23.76	16.1	5.25	15.26	16.1	50.87	33.37	16.2	28.82	19.37	16.3	25.24	41.26
17.0	39.51	23.45	17.1	5.21	14.98	17.1	50.78	33.12	17.2	28.24	19.22	17.3	24.77	41.35
18.0	39.46	23.11	18.1	5.16	14.69	18.1	50.69	32.86	18.2	27.62	19.08	18.3	24.26	41.45
19.0	39.40	22.74	19.1	5.11	14.37	19.1	50.59	32.58	19.2	26.95	18.92	19.3	23.71	41.55
20.0	39.40	22.36	20.1	5.07	14.03	20.1	50.49	32.27	20.2	26.27	18.73	20.3	23.13	41.64
21.0	39.49	21.97	21.1	5.03	13.67	21.1	50.40	31.94	21.2	25.58	18.52	21.3	22.52	41.70
22.0	39.67	21.58	22.1	5.01	13.29	22.1	50.32	31.59	22.2	24.92	18.27	22.3	21.89	41.73
23.0	39.97	21.19	23.1	5.00	12.91	23.1	50.25	31.23	23.2	24.31	18.01	23.3	21.27	41.73
24.0	40.33	20.82	24.1	4.99	12.54	24.1	50.21	30.87	24.2	23.76	17.74	24.3	20.69	41.71
25.0	40.74	20.47	25.1	5.00	12.19	25.1	50.17	30.54	25.2	23.27	17.47	25.3	20.14	41.68
25.9	41.15	20.15	26.0	5.02	11.87	26.1	50.14	30.21	26.2	22.81	17.21	26.3	19.63	41.65
26.9	41.52	19.84	27.0	5.03	11.57	27.1	50.11	29.91	27.2	22.38	16.98	27.3	19.14	41.62
27.9	41.83	19.54	28.0	5.03	11.27	28.1	50.07	29.63	28.2	21.93	16.75	28.3	18.66	41.60
28.9	42.07	19.24	29.0	5.03	10.97	29.1	50.02	29.35	29.2	21.46	16.55	29.3	18.17	41.61
29.9	42.27	18.93	30.0	5.02	10.67	30.1	49.96	29.06	30.2	20.94	16.34	30.3	17.67	41.63
30.9	42.46	18.59	31.0	5.00	10.36	31.1	49.90	28.76	31.2	20.39	16.14	31.3	17.15	41.66
31.9	42.65	18.24	32.0	4.98	10.02	32.1	49.83	28.44	32.2	19.81	15.92	32.3	16.59	41.70
51.62	+51.61		6.93	+6.86		8.20	+8.14		31.35	+31.33		23.50	+23.48	
8 <sup>h</sup> 13 <sup>m</sup>	47 <sup>s</sup> .916		9 <sup>h</sup> 25 <sup>m</sup>	4 <sup>s</sup> .133		10 <sup>h</sup> 20 <sup>m</sup>	49 <sup>s</sup> .679		12 <sup>h</sup> 14 <sup>m</sup>	27 <sup>s</sup> .688		15 <sup>h</sup> 4 <sup>m</sup>	20 <sup>s</sup> .10	
+88° 53'	22''.50		+81° 42'	12''.85		+82° 59'	30''.46		+88° 10'	15''.98		+87° 33'	38''.31	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			80 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 283. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
Aug.	h m s	° '	Aug.	h m s	° '	Aug.	h m s	° '	Aug.	h m s	° '	Aug.	h m s	° '
	8 13	+88 53		9 25	+81 41		10 20	+82 59		12 14	+88 10		15 3	+87 33
0.9	42.65	18.24	1.0	4.98	70.02	1.1	49.83	28.44	1.2	19.81	15.92	1.3	76.59	41.70
1.9	42.88	17.86	2.0	4.97	69.67	2.1	49.77	28.11	2.1	19.22	15.68	2.3	76.01	41.72
2.9	43.17	17.49	3.0	4.97	69.30	3.1	49.71	27.77	3.1	18.63	15.42	3.3	75.41	41.72
3.9	43.53	17.11	4.0	4.97	68.93	4.1	49.65	27.40	4.1	18.05	15.14	4.3	74.80	41.71
4.9	43.95	16.74	5.0	4.98	68.56	5.1	49.61	27.03	5.1	17.51	14.85	5.3	74.20	41.67
5.9	44.45	16.37	6.0	4.99	68.18	6.1	49.59	26.66	6.1	17.01	14.55	6.3	73.60	41.61
6.9	44.99	16.02	7.0	5.02	67.81	7.1	49.57	26.29	7.1	16.55	14.24	7.3	73.01	41.53
7.9	45.58	15.69	8.0	5.06	67.45	8.1	49.56	25.93	8.1	16.13	13.93	8.2	72.45	41.45
8.9	46.18	15.36	9.0	5.09	67.11	9.1	49.55	25.58	9.1	15.74	13.62	9.2	71.92	41.35
9.9	46.78	15.05	10.0	5.13	66.78	10.0	49.55	25.24	10.1	15.38	13.32	10.2	71.41	41.25
10.9	47.36	14.76	11.0	5.17	66.47	11.0	49.55	24.92	11.1	15.02	13.04	11.2	70.91	41.16
11.9	47.87	14.47	12.0	5.21	66.16	12.0	49.54	24.61	12.1	14.65	12.77	12.2	70.42	41.09
12.9	48.34	14.18	13.0	5.23	65.85	13.0	49.53	24.30	13.1	14.26	12.51	13.2	69.92	41.03
13.9	48.77	13.87	13.9	5.25	65.53	14.0	49.50	23.99	14.1	13.82	12.25	14.2	69.40	40.99
14.9	49.20	13.53	14.9	5.27	65.19	15.0	49.47	23.65	15.1	13.34	11.98	15.2	68.84	40.95
15.9	49.65	13.18	15.9	5.29	64.83	16.0	49.43	23.29	16.1	12.84	11.69	16.2	68.25	40.89
16.9	50.17	12.80	16.9	5.31	64.44	17.0	49.41	22.90	17.1	12.32	11.38	17.2	67.63	40.82
17.9	50.78	12.43	17.9	5.34	64.04	18.0	49.39	22.50	18.1	11.83	11.03	18.2	67.00	40.73
18.9	51.50	12.06	18.9	5.38	63.64	19.0	49.39	22.09	19.1	11.39	10.67	19.2	66.37	40.61
19.9	52.30	11.71	19.9	5.44	63.24	20.0	49.40	21.68	20.1	11.00	10.30	20.2	65.76	40.46
20.9	53.16	11.37	20.9	5.52	62.86	21.0	49.43	21.28	21.1	10.68	9.92	21.2	65.19	40.29
21.9	54.03	11.07	21.9	5.59	62.51	22.0	49.47	20.90	22.1	10.40	9.55	22.2	64.66	40.12
22.9	54.88	10.79	22.9	5.66	62.18	23.0	49.51	20.54	23.1	10.16	9.21	23.2	64.16	39.94
23.9	55.67	10.52	23.9	5.73	61.87	24.0	49.54	20.21	24.1	9.91	8.88	24.2	63.68	39.78
24.9	56.39	10.26	24.9	5.79	61.57	25.0	49.57	19.88	25.1	9.65	8.57	25.2	63.21	39.64
25.9	57.04	9.98	25.9	5.84	61.25	26.0	49.58	19.55	26.1	9.34	8.27	26.2	62.72	39.52
26.9	57.69	9.69	26.9	5.89	60.93	27.0	49.59	19.22	27.1	9.02	7.97	27.2	62.22	39.41
27.9	58.32	9.39	27.9	5.93	60.59	27.9	49.59	18.87	28.1	8.65	7.65	28.2	61.69	39.31
28.9	58.98	9.07	28.9	5.98	60.24	28.9	49.60	18.50	29.1	8.27	7.33	29.2	61.14	39.19
29.9	59.68	8.74	29.9	6.03	59.87	29.9	49.60	18.12	30.1	7.89	6.99	30.2	60.57	39.06
30.9	60.45	8.40	30.9	6.09	59.49	30.9	49.62	17.73	31.1	7.53	6.63	31.2	59.98	38.92
31.9	61.28	8.07	31.9	6.16	59.12	31.9	49.64	17.33	32.1	7.20	6.25	32.2	59.40	38.76
51.48	+51.47		6.93	+6.86		8.19	+8.13		31.31	+31.30		23.50	+23.48	
8 <sup>h</sup> 13 <sup>m</sup>	47 <sup>s</sup> .916		9 <sup>h</sup> 25 <sup>m</sup>	4 <sup>s</sup> .133		10 <sup>h</sup> 20 <sup>m</sup>	49 <sup>s</sup> .679		12 <sup>h</sup> 14 <sup>m</sup>	27 <sup>s</sup> .688		15 <sup>h</sup> 4 <sup>m</sup>	20 <sup>s</sup> .10	
+88° 53'	22''.50		+81° 42'	12''.85		+82° 59'	30''.46		+88° 10'	15''.98		+87° 33'	38''.31	

• APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

Bridge 1119. Mag. 7.0		1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2283. Mag. 7.2		
Right Ascen- sion.	Declin- ation North.	Mean Solar Date.	Right Ascen- sion.	Declin- ation North.	Mean Solar Date.	Right Ascen- sion.	Declin- ation North.	Mean Solar Date.	Right Ascen- sion.	Declin- ation North.	Mean Solar Date.	Right Ascen- sion.	Declin- ation North.
h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
8 14	+88 53	Sept.	9 25	+81 41	Sept.	10 20	+82 59	Sept.	12 14	+88 9	Sept.	15 3	+87 33
s	"		s	"		s	"		s	"		s	"
1.28	8.07	0.9	6.16	59.12	0.9	49.64	17.33	1.1	7.20	66.25	1.2	59.40	38.76
2.18	7.75	1.9	6.23	58.75	1.9	49.67	16.93	2.1	6.90	65.86	2.2	58.83	38.57
3.13	7.44	2.9	6.32	58.38	2.9	49.72	16.53	3.1	6.64	65.47	3.2	58.27	38.36
4.12	7.15	3.9	6.41	58.03	3.9	49.78	16.14	4.1	6.43	65.08	4.2	57.74	38.14
5.13	6.88	4.9	6.51	57.69	4.9	49.85	15.77	5.1	6.26	64.69	5.2	57.24	37.91
6.14	6.63	5.9	6.61	57.37	5.9	49.92	15.41	6.1	6.12	64.31	6.2	56.77	37.69
7.13	6.39	6.9	6.71	57.06	6.9	49.99	15.06	7.0	5.99	63.95	7.2	56.32	37.46
8.08	6.15	7.9	6.81	56.76	7.9	50.05	14.72	8.0	5.86	63.60	8.2	55.88	37.25
9.08	5.92	8.9	6.90	56.47	8.9	50.12	14.39	9.0	5.71	63.26	9.2	55.43	37.05
10.82	5.68	9.9	6.98	56.17	9.9	50.17	14.06	10.0	5.52	62.93	10.2	54.98	36.87
11.64	5.41	10.9	7.05	55.85	10.9	50.21	13.72	11.0	5.30	62.59	11.2	54.50	36.69
12.47	5.14	11.9	7.12	55.52	11.9	50.24	13.36	12.0	5.05	62.24	12.2	53.99	36.52
13.34	4.84	12.9	7.20	55.16	12.9	50.28	12.97	13.0	4.78	61.86	13.2	53.44	36.34
14.31	4.53	13.9	7.28	54.78	13.9	50.33	12.56	14.0	4.52	61.46	14.1	52.88	36.13
15.35	4.22	14.9	7.38	54.40	14.9	50.39	12.14	15.0	4.30	61.05	15.1	52.32	35.89
16.48	3.93	15.9	7.49	54.03	15.9	50.46	11.73	16.0	4.13	60.62	16.1	51.78	35.62
17.69	3.66	16.9	7.61	53.68	16.9	50.56	11.32	17.0	4.03	60.18	17.1	51.27	35.33
18.93	3.43	17.9	7.74	53.35	17.9	50.67	10.94	18.0	4.00	59.76	18.1	50.80	35.04
19.15	3.22	18.9	7.88	53.05	18.9	50.78	10.59	19.0	3.99	59.36	19.1	50.38	34.74
20.30	3.02	19.9	8.00	52.76	19.9	50.88	10.25	20.0	4.00	58.98	20.1	49.98	34.46
21.40	2.84	20.9	8.12	52.49	20.9	50.98	9.93	21.0	4.01	58.61	21.1	49.60	34.19
22.41	2.65	21.9	8.23	52.23	21.9	51.07	9.62	22.0	3.98	58.26	22.1	49.22	33.95
23.40	2.46	22.9	8.33	51.95	22.9	51.15	9.29	23.0	3.91	57.91	23.1	48.82	33.72
24.35	2.24	23.9	8.43	51.67	23.9	51.22	8.96	24.0	3.82	57.56	24.1	48.40	33.50
25.32	2.01	24.9	8.53	51.37	24.9	51.30	8.62	24.9	3.70	57.20	25.1	47.95	33.27
26.32	1.77	25.9	8.63	51.06	25.9	51.37	8.27	25.9	3.57	56.82	26.1	47.48	33.03
27.38	1.53	26.9	8.74	50.73	26.9	51.45	7.90	26.9	3.47	56.43	27.1	47.01	32.77
28.51	1.28	27.9	8.85	50.40	27.9	51.54	7.52	27.9	3.39	56.03	28.1	46.54	32.50
29.59	1.05	28.9	8.97	50.08	28.9	51.65	7.14	28.9	3.33	55.61	29.1	46.08	32.22
30.92	0.83	29.9	9.10	49.76	29.9	51.76	6.77	29.9	3.33	55.19	30.1	45.64	31.91
31.99	0.63	30.9	9.25	49.45	30.9	51.88	6.41	30.9	3.37	54.77	31.1	45.22	31.59
32.99	0.45	31.9	9.39	49.17	31.9	52.01	6.06	31.9	3.45	54.35	32.1	44.84	31.25
+51.35		6.92	+6.85		8.19	+8.13		31.26	+31.25		23.49	+23.47	
47° 9' 16"		9 <sup>h</sup> 25 <sup>m</sup>	4° 13' 33"		10 <sup>h</sup> 20 <sup>m</sup>	49° 6' 79"		12 <sup>h</sup> 14 <sup>m</sup>	27° 6' 88"		15 <sup>h</sup> 4 <sup>m</sup>	20° 10'	
22'' 50		+81° 42'	12'' 85		+82° 59'	30'' 46		+88° 10'	15'' 98		+87° 33'	38'' 31	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1672. Mag. 6.3			Groombridge 2283. Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Nov.	8 15	+88 52	Nov.	9 25	+81 41	Nov.	10 20	+82 58	Nov.	12 14	+88 9	Nov.	15 3	+87 33
	s	"		s	"		s	"		s	"		s	"
0.7	11.54	57.01	0.8	14.00	42.41	0.8	56.41	57.25	0.9	9.17	43.05	1.0	36.27	21.08
1.7	12.83	57.01	1.8	14.18	42.29	1.8	56.59	57.05	1.9	9.58	42.73	2.0	36.17	20.72
2.7	14.06	57.02	2.8	14.35	42.17	2.8	56.76	56.86	2.9	9.96	42.42	3.0	36.07	20.37
3.7	15.25	57.01	3.8	14.50	42.05	3.8	56.93	56.67	3.9	10.32	42.12	4.0	35.95	20.04
4.7	16.39	56.99	4.8	14.65	41.92	4.8	57.09	56.46	4.9	10.64	41.82	5.0	35.82	19.71
5.7	17.55	56.95	5.8	14.81	41.76	5.8	57.24	56.24	5.9	10.92	41.50	6.0	35.65	19.38
6.7	18.74	56.90	6.8	14.97	41.59	6.8	57.40	56.00	6.9	11.20	41.17	7.0	35.45	19.04
7.7	20.01	56.84	7.8	15.13	41.41	7.8	57.56	55.74	7.9	11.50	40.82	7.9	35.25	18.69
8.7	21.35	56.78	8.8	15.30	41.24	8.8	57.74	55.49	8.9	11.83	40.45	8.9	35.06	18.31
9.7	22.76	56.75	9.8	15.49	41.07	9.8	57.93	55.24	9.9	12.21	40.07	9.9	34.90	17.91
10.7	24.22	56.74	10.8	15.69	40.92	10.8	58.14	55.00	10.9	12.67	39.70	10.9	34.77	17.48
11.7	25.69	56.77	11.8	15.89	40.80	11.8	58.35	54.79	11.9	13.18	39.35	11.9	34.70	17.05
12.7	27.13	56.82	12.8	16.09	40.71	12.8	58.57	54.61	12.9	13.72	39.02	12.9	34.67	16.63
13.7	28.47	56.88	13.7	16.28	40.65	13.8	58.78	54.45	13.9	14.27	38.72	13.9	34.66	16.23
14.7	29.73	56.97	14.7	16.46	40.61	14.8	58.98	54.32	14.9	14.81	38.45	14.9	34.68	15.86
15.7	30.91	57.04	15.7	16.63	40.56	15.8	59.17	54.19	15.9	15.31	38.19	15.9	34.70	15.51
16.7	32.04	57.11	16.7	16.79	40.51	16.8	59.35	54.07	16.9	15.79	37.93	16.9	34.70	15.18
17.7	33.13	57.16	17.7	16.95	40.45	17.8	59.52	53.94	17.9	16.22	37.68	17.9	34.68	14.85
18.7	34.24	57.19	18.7	17.11	40.38	18.8	59.69	53.79	18.9	16.63	37.42	18.9	34.64	14.53
19.7	35.36	57.22	19.7	17.27	40.29	19.8	59.86	53.63	19.8	17.04	37.15	19.9	34.59	14.20
20.7	36.53	57.25	20.7	17.44	40.20	20.8	60.04	53.46	20.8	17.46	36.87	20.9	34.54	13.85
21.7	37.75	57.28	21.7	17.61	40.11	21.8	60.23	53.29	21.8	17.91	36.57	21.9	34.50	13.48
22.7	39.01	57.32	22.7	17.78	40.03	22.8	60.42	53.13	22.8	18.39	36.27	22.9	34.46	13.10
23.7	40.31	57.38	23.7	17.97	39.95	23.8	60.63	52.98	23.8	18.92	35.99	23.9	34.45	12.71
24.7	41.61	57.47	24.7	18.15	39.90	24.8	60.84	52.84	24.8	19.49	35.70	24.9	34.48	12.32
25.7	42.92	57.57	25.7	18.35	39.87	25.8	61.06	52.72	25.8	20.09	35.42	25.9	34.54	11.93
26.7	44.22	57.70	26.7	18.55	39.86	26.8	61.28	52.61	26.8	20.72	35.16	26.9	34.63	11.53
27.7	45.46	57.84	27.7	18.73	39.87	27.7	61.50	52.53	27.8	21.37	34.91	27.9	34.74	11.15
28.7	46.65	57.98	28.7	18.92	39.90	28.7	61.72	52.47	28.8	22.01	34.69	28.9	34.88	10.78
29.7	47.77	58.13	29.7	19.09	39.93	29.7	61.92	52.42	29.8	22.64	34.49	29.9	35.03	10.43
30.7	48.81	58.28	30.7	19.26	39.96	30.7	62.11	52.37	30.8	23.23	34.30	30.9	35.17	10.10
31.6	49.82	58.41	31.7	19.42	39.98	31.7	62.30	52.32	31.8	23.78	34.12	31.9	35.28	9.79
51.28	+51.27		6.92	+6.85		8.18	+8.12		31.15	+31.14		23.43	+23.41	
8 <sup>h</sup> 13 <sup>m</sup>	47° 9' 16"		9 <sup>h</sup> 25 <sup>m</sup>	4° 1' 33"		10 <sup>h</sup> 20 <sup>m</sup>	49° 6' 79"		12 <sup>h</sup> 14 <sup>m</sup>	27° 6' 88"		15 <sup>h</sup> 4 <sup>m</sup>	20° 1' 10"	
+88° 53'	22'' 50		+81° 42'	12'' 85		+82° 59'	30'' 46		+88° 10'	15'' 98		+87° 33'	38'' 31	
33281°—1915—18					[Eph 15]									



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Groombridge 1119. Mag. 7.0			1 H. Draconis. Mag. 4.6			30 H. Camelop. Mag. 5.3			Bradley 1872. Mag. 6.3			Groombridge 2 Mag. 7.2		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.
Dec.	h m	° '	Dec.	h m	° '	Dec.	h m	° '	Dec.	h m	° '	Dec.	h m	° '
	s	"		s	"		s	"		s	"		s	"
0.7	48.81	58.28	0.7	19.26	39.96	0.7	2.11	52.37	0.8	23.23	34.30	0.9	35.17	1
1.6	49.82	58.41	1.7	19.42	39.98	1.7	2.30	52.32	1.8	23.78	34.12	1.9	35.28	
2.6	50.81	58.53	2.7	19.57	39.99	2.7	2.47	52.25	2.8	24.29	33.93	2.9	35.37	
3.6	51.81	58.64	3.7	19.72	39.98	3.7	2.65	52.17	3.8	24.78	33.72	3.9	35.44	
4.6	52.86	58.73	4.7	19.88	39.96	4.7	2.83	52.08	4.8	25.28	33.49	4.9	35.49	
5.6	53.98	58.82	5.7	20.04	39.92	5.7	3.02	51.97	5.8	25.80	33.25	5.9	35.54	
6.6	55.18	58.92	6.7	20.22	39.90	6.7	3.24	51.86	6.8	26.37	33.00	6.9	35.61	
7.6	56.43	59.04	7.7	20.41	39.89	7.7	3.45	51.77	7.8	27.00	32.76	7.9	35.71	
8.6	57.68	59.20	8.7	20.60	39.91	8.7	3.68	51.70	8.8	27.69	32.52	8.9	35.86	
9.6	58.90	59.38	9.7	20.80	39.97	9.7	3.91	51.67	9.8	28.42	32.31	9.9	36.06	
10.6	60.06	59.59	10.7	20.99	40.05	10.7	4.13	51.66	10.8	29.15	32.13	10.9	36.30	
11.6	61.12	59.81	11.7	21.17	40.15	11.7	4.35	51.67	11.8	29.88	31.98	11.9	36.56	
12.6	62.08	60.03	12.7	21.34	40.25	12.7	4.56	51.70	12.8	30.58	31.85	12.9	36.82	
13.6	62.96	60.24	13.7	21.49	40.36	13.7	4.75	51.74	13.8	31.25	31.74	13.9	37.08	
14.6	63.80	60.44	14.7	21.63	40.46	14.7	4.93	51.77	14.8	31.86	31.63	14.9	37.31	
15.6	64.61	60.62	15.7	21.77	40.55	15.7	5.10	51.78	15.8	32.45	31.51	15.9	37.53	
16.6	65.44	60.79	16.7	21.91	40.63	16.7	5.27	51.79	16.8	33.02	31.39	16.9	37.73	
17.6	66.29	60.96	17.7	22.05	40.69	17.7	5.45	51.79	17.8	33.60	31.26	17.9	37.92	
18.6	67.18	61.13	18.7	22.20	40.76	18.7	5.63	51.78	18.8	34.19	31.12	18.9	38.12	
19.6	68.12	61.31	19.7	22.36	40.82	19.7	5.81	51.78	19.8	34.82	30.97	19.9	38.33	
20.6	69.07	61.51	20.6	22.52	40.90	20.7	6.01	51.79	20.8	35.47	30.83	20.9	38.55	
21.6	70.05	61.72	21.6	22.68	41.00	21.7	6.21	51.81	21.8	36.17	30.69	21.9	38.80	
22.6	71.02	61.95	22.6	22.84	41.12	22.7	6.41	51.85	22.8	36.90	30.56	22.9	39.09	
23.6	71.97	62.20	23.6	23.01	41.26	23.7	6.62	51.90	23.8	37.66	30.45	23.9	39.41	
24.6	72.87	62.46	24.6	23.17	41.42	24.7	6.83	51.98	24.8	38.42	30.36	24.9	39.76	
25.6	73.71	62.74	25.6	23.33	41.58	25.7	7.04	52.07	25.8	39.19	30.29	25.9	40.12	
26.6	74.48	63.02	26.6	23.49	41.76	26.7	7.24	52.18	26.7	39.93	30.24	26.9	40.49	
27.6	75.17	63.31	27.6	23.62	41.96	27.7	7.42	52.29	27.7	40.65	30.21	27.9	40.88	
28.6	75.80	63.58	28.6	23.74	42.14	28.7	7.59	52.41	28.7	41.33	30.20	28.9	41.24	
29.6	76.38	63.83	29.6	23.87	42.30	29.7	7.75	52.52	29.7	41.96	30.17	29.9	41.57	
30.6	76.96	64.05	30.6	23.98	42.45	30.7	7.90	52.61	30.7	42.56	30.14	30.9	41.88	
31.6	77.58	64.27	31.6	24.10	42.59	31.7	8.06	52.69	31.7	43.14	30.10	31.9	42.16	
51.32	+51.31		6.92	+6.85		8.18	+8.12		31.12	+31.11		23.41	+23.41	
8 <sup>h</sup> 13 <sup>m</sup>	47 <sup>s</sup> .916		9 <sup>h</sup> 25 <sup>m</sup>	4 <sup>s</sup> .133		10 <sup>h</sup> 20 <sup>m</sup>	49 <sup>s</sup> .679		12 <sup>h</sup> 14 <sup>m</sup>	27 <sup>s</sup> .688		15 <sup>h</sup> 4 <sup>m</sup>	20 <sup>s</sup>	
+88° 53'	22'' .50		+81° 42'	12'' .85		+82° 59'	30'' .46		+88° 10'	15'' .98		+87° 33'	38'	

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

α Ursæ Minoris. Mag. 4.4		δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			39 H. Cephei. Mag. 5.6		
Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.
h m 16 54	° ' +82 10	Jan.	h m 17 59	° ' +86 36	Jan.	h m 19 3	° ' +89 0	Jan.	h m 20 48	° ' +82 13	Jan.	h m 23 27	° ' +86 50
s	"		s	"		s	"		s	"		s	"
28.83	27.10	0.9	14.03	40.49	1.0	23.85	47.52	1.1	37.22	10.73	1.2	28.42	41.13
28.87	26.73	1.9	13.99	40.12	2.0	23.33	47.18	2.1	37.10	10.46	2.2	27.98	41.11
28.93	26.35	2.9	13.99	39.73	3.0	22.88	46.83	3.1	36.98	10.18	3.2	27.54	41.07
29.00	25.98	3.9	14.01	39.34	4.0	22.51	46.46	4.1	36.87	9.88	4.2	27.10	41.00
29.07	25.61	4.9	14.06	38.97	5.0	22.25	46.10	5.1	36.77	9.57	5.2	26.68	40.91
29.15	25.27	5.9	14.13	38.61	6.0	22.08	45.74	6.1	36.68	9.25	6.2	26.28	40.79
29.24	24.95	6.9	14.22	38.27	6.9	22.00	45.40	7.1	36.61	8.95	7.2	25.91	40.67
29.33	24.65	7.9	14.31	37.96	7.9	21.94	45.09	8.1	36.55	8.66	8.2	25.57	40.55
29.41	24.38	8.9	14.39	37.67	8.9	21.89	44.80	9.1	36.49	8.40	9.2	25.26	40.45
29.48	24.12	9.9	14.45	37.39	9.9	21.79	44.52	10.1	36.43	8.15	10.2	24.96	40.36
29.55	23.86	10.9	14.50	37.11	10.9	21.63	44.25	11.1	36.36	7.91	11.2	24.66	40.28
29.60	23.58	11.9	14.53	36.82	11.9	21.40	43.98	12.1	36.29	7.68	12.2	24.33	40.22
29.66	23.28	12.9	14.55	36.51	12.9	21.11	43.68	13.1	36.20	7.44	13.2	23.97	40.16
29.72	22.95	13.9	14.58	36.18	13.9	20.83	43.36	14.1	36.11	7.16	14.2	23.59	40.09
29.80	22.61	14.9	14.64	35.82	14.9	20.61	43.01	15.1	36.02	6.86	15.2	23.19	39.99
29.88	22.27	15.9	14.72	35.45	15.9	20.46	42.64	16.0	35.93	6.54	16.2	22.78	39.87
29.99	21.94	16.9	14.83	35.09	16.9	20.42	42.27	17.0	35.86	6.20	17.2	22.37	39.72
30.11	21.62	17.9	14.97	34.74	17.9	20.49	41.90	18.0	35.80	5.85	18.2	21.99	39.55
30.23	21.32	18.9	15.13	34.40	18.9	20.67	41.54	19.0	35.75	5.50	19.1	21.63	39.36
30.35	21.05	19.9	15.31	34.09	19.9	20.90	41.20	20.0	35.71	5.16	20.1	21.31	39.16
30.47	20.80	20.9	15.50	33.79	20.9	21.18	40.89	21.0	35.68	4.83	21.1	21.01	38.96
30.59	20.57	21.9	15.68	33.51	21.9	21.46	40.59	22.0	35.67	4.52	22.1	20.72	38.76
30.70	20.34	22.9	15.85	33.25	22.9	21.74	40.30	23.0	35.65	4.23	23.1	20.45	38.58
30.81	20.12	23.9	16.01	33.00	23.9	21.99	40.02	24.0	35.62	3.94	24.1	20.19	38.41
30.91	19.91	24.9	16.17	32.74	24.9	22.21	39.74	25.0	35.59	3.65	25.1	19.93	38.24
31.02	19.68	25.9	16.31	32.48	25.9	22.37	39.46	26.0	35.56	3.37	26.1	19.65	38.08
31.12	19.44	26.9	16.45	32.20	26.9	22.51	39.16	27.0	35.52	3.08	27.1	19.35	37.93
31.22	19.19	27.9	16.60	31.91	27.9	22.68	38.85	28.0	35.49	2.78	28.1	19.03	37.76
31.33	18.92	28.9	16.76	31.60	28.9	22.85	38.53	29.0	35.45	2.46	29.1	18.70	37.59
31.45	18.65	29.9	16.93	31.28	29.9	23.05	38.19	30.0	35.41	2.11	30.1	18.36	37.39
31.58	18.38	30.9	17.12	30.96	30.9	23.34	37.84	31.0	35.37	1.75	31.1	18.02	37.17
31.72	18.12	31.9	17.35	30.65	31.9	23.72	37.48	32.0	35.35	1.39	32.1	17.69	36.93
+7.27		16.91 +16.88			57.98 +57.98			7.38 +7.32			18.17 +18.14		
37°.997		17 <sup>h</sup> 59 <sup>m</sup> 40°.30			19 <sup>h</sup> 5 <sup>m</sup> 3°.27			20 <sup>h</sup> 48 <sup>m</sup> 48°.820			23 <sup>h</sup> 27 <sup>m</sup> 44°.653		
44''.05		+86° 36' 51''.19			+89° 0' 51''.13			+82° 13' 2''.89			+86° 50' 19''.16		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			39 H. Ceph Mag. 5.6	
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.
	h m	° '		h m	° '		h m	° '		h m	° '		h m
Feb.	16 54	+82 10	Feb.	17 59	+86 36	Feb.	19 3	+89 0	Feb.	20 48	+82 12	Feb.	23 27
	s	"		s	"		s	"		s	"		s
0.8	31.72	18.12	0.9	17.35	30.65	0.9	23.72	37.48	1.0	35.35	61.39	1.1	17.69
1.8	31.87	17.89	1.9	17.59	30.35	1.9	24.21	37.14	2.0	35.34	61.02	2.1	17.39
2.8	32.02	17.68	2.9	17.86	30.08	2.9	24.78	36.82	2.9	35.34	60.66	3.1	17.12
3.8	32.17	17.49	3.9	18.13	29.83	3.9	25.40	36.52	3.9	35.36	60.31	4.1	16.89
4.8	32.32	17.33	4.9	18.40	29.61	4.9	26.03	36.25	4.9	35.39	59.99	5.1	16.69
5.8	32.46	17.20	5.9	18.66	29.41	5.9	26.64	36.00	5.9	35.41	59.68	6.1	16.50
6.8	32.59	17.07	6.9	18.89	29.22	6.9	27.19	35.77	6.9	35.43	59.40	7.1	16.32
7.8	32.71	16.92	7.9	19.10	29.03	7.9	27.65	35.54	7.9	35.44	59.13	8.1	16.12
8.8	32.83	16.76	8.9	19.29	28.81	8.9	28.06	35.29	8.9	35.44	58.86	9.1	15.91
9.8	32.95	16.58	9.9	19.49	28.58	9.9	28.45	35.02	9.9	35.43	58.57	10.1	15.67
10.8	33.07	16.38	10.9	19.70	28.33	10.9	28.86	34.73	10.9	35.43	58.25	11.1	15.41
11.8	33.21	16.17	11.9	19.94	28.07	11.9	29.35	34.43	11.9	35.42	57.91	12.1	15.14
12.8	33.37	15.98	12.9	20.20	27.80	12.9	29.93	34.11	12.9	35.43	57.55	13.1	14.88
13.8	33.53	15.80	13.9	20.49	27.54	13.9	30.61	33.80	13.9	35.45	57.19	14.1	14.64
14.8	33.70	15.64	14.9	20.81	27.30	14.9	31.39	33.50	14.9	35.48	56.83	15.1	14.42
15.8	33.87	15.51	15.8	21.15	27.09	15.9	32.23	33.22	15.9	35.53	56.47	16.1	14.23
16.8	34.04	15.41	16.8	21.49	26.91	16.9	33.13	32.97	16.9	35.59	56.13	17.1	14.08
17.8	34.20	15.32	17.8	21.82	26.75	17.9	34.04	32.73	17.9	35.65	55.82	18.1	13.95
18.8	34.36	15.25	18.8	22.15	26.60	18.9	34.94	32.51	18.9	35.71	55.52	19.1	13.84
19.8	34.52	15.19	19.8	22.46	26.46	19.9	35.81	32.31	19.9	35.77	55.23	20.1	13.73
20.8	34.66	15.13	20.8	22.77	26.33	20.9	36.65	32.11	20.9	35.83	54.95	21.1	13.63
21.8	34.80	15.07	21.8	23.06	26.19	21.9	37.45	31.91	21.9	35.88	54.69	22.1	13.52
22.8	34.95	14.99	22.8	23.34	26.05	22.9	38.21	31.71	22.9	35.93	54.42	23.1	13.39
23.8	35.09	14.90	23.8	23.62	25.89	23.9	38.94	31.50	23.9	35.98	54.14	24.1	13.26
24.8	35.24	14.81	24.8	23.90	25.73	24.9	39.67	31.27	24.9	36.02	53.84	25.0	13.11
25.8	35.39	14.70	25.8	24.19	25.55	25.9	40.45	31.04	25.9	36.06	53.54	26.0	12.96
26.8	35.55	14.60	26.8	24.50	25.37	26.9	41.26	30.79	26.9	36.11	53.22	27.0	12.80
27.8	35.72	14.50	27.8	24.84	25.20	27.9	42.14	30.53	27.9	36.16	52.89	28.0	12.65
28.8	35.89	14.43	28.8	25.19	25.03	28.9	43.13	30.29	28.9	36.23	52.56	29.0	12.52
29.8	36.07	14.38	29.8	25.56	24.88	29.9	44.19	30.07	29.9	36.31	52.23	30.0	12.42
30.8	36.25	14.36	30.8	25.95	24.76	30.9	45.32	29.87	30.9	36.40	51.92	31.0	12.36
31.8	36.42	14.36	31.8	26.33	24.68	31.8	46.48	29.70	31.9	36.50	51.64	32.0	12.34
7.34 +7.27			16.90 +16.87			57.83 +57.82			7.38 +7.31			18.16	
16 <sup>h</sup> 54 <sup>m</sup> 37 <sup>s</sup> .997			17 <sup>h</sup> 59 <sup>m</sup> 40 <sup>s</sup> .30			19 <sup>h</sup> 5 <sup>m</sup> 3 <sup>s</sup> .27			20 <sup>h</sup> 48 <sup>m</sup> 48 <sup>s</sup> .820			23 <sup>h</sup> 27 <sup>m</sup>	
+82° 10' 44".05			+86° 36' 51".19			+89° 0' 51".13			+82° 13' 2".89			+86° 50'	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			89 H. C. Mag.	
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.
Apr.	h m 16 54	° ' +82 10	Apr.	h m 17 59	° ' +86 36	Apr.	h m 19 4	° ' +89 0	Apr.	h m 20 48	° ' +82 12	Apr.	h m 23 27
	s "	"		s "	"		s "	"		s "	"		s "
0.7	40.71	16.32	0.7	36.21	24.28	0.8	18.07	26.93	0.8	39.71	45.61	0.9	13.56
1.7	40.85	16.53	1.7	36.56	24.41	1.8	19.36	26.97	1.8	39.87	45.50	1.9	13.77
2.7	40.98	16.74	2.7	36.88	24.54	2.8	20.55	27.01	2.8	40.02	45.41	2.9	13.98
3.7	41.09	16.94	3.7	37.18	24.67	3.8	21.64	27.06	3.8	40.15	45.34	3.9	14.18
4.7	41.19	17.12	4.7	37.47	24.78	4.8	22.68	27.10	4.8	40.29	45.26	4.9	14.36
5.7	41.30	17.28	5.7	37.75	24.88	5.8	23.67	27.12	5.8	40.42	45.17	5.9	14.51
6.7	41.40	17.43	6.7	38.04	24.96	6.8	24.69	27.12	6.8	40.55	45.06	6.9	14.64
7.7	41.52	17.57	7.7	38.35	25.02	7.8	25.77	27.11	7.8	40.67	44.93	7.9	14.77
8.7	41.65	17.71	8.7	38.69	25.09	8.8	26.90	27.09	8.8	40.81	44.79	8.9	14.91
9.7	41.80	17.87	9.7	39.04	25.17	9.7	28.13	27.08	9.8	40.95	44.65	9.9	15.07
10.7	41.95	18.06	10.7	39.40	25.27	10.7	29.41	27.09	10.8	41.11	44.52	10.9	15.25
11.7	42.09	18.28	11.7	39.77	25.40	11.7	30.75	27.12	11.8	41.27	44.41	11.9	15.46
12.6	42.23	18.52	12.7	40.14	25.55	12.7	32.10	27.18	12.8	41.44	44.32	12.9	15.71
13.6	42.36	18.77	13.7	40.50	25.72	13.7	33.42	27.26	13.8	41.61	44.25	13.9	15.98
14.6	42.49	19.04	14.7	40.83	25.91	14.7	34.70	27.36	14.8	41.79	44.20	14.9	16.27
15.6	42.60	19.31	15.7	41.15	26.11	15.7	35.94	27.47	15.8	41.97	44.17	15.9	16.55
16.6	42.70	19.57	16.7	41.45	26.31	16.7	37.11	27.59	16.8	42.13	44.16	16.9	16.84
17.6	42.79	19.83	17.7	41.73	26.50	17.7	38.21	27.71	17.8	42.29	44.14	17.9	17.12
18.6	42.88	20.08	18.7	41.99	26.69	18.7	39.27	27.82	18.8	42.44	44.14	18.9	17.38
19.6	42.97	20.31	19.7	42.25	26.87	19.7	40.28	27.92	19.8	42.59	44.12	19.9	17.63
20.6	43.06	20.53	20.7	42.51	27.03	20.7	41.28	28.01	20.8	42.73	44.10	20.9	17.87
21.6	43.16	20.74	21.7	42.77	27.19	21.7	42.28	28.09	21.8	42.87	44.06	21.9	18.06
22.6	43.26	20.96	22.7	43.05	27.34	22.7	43.32	28.16	22.8	43.01	44.02	22.9	18.31
23.6	43.36	21.18	23.7	43.34	27.49	23.7	44.42	28.23	23.8	43.16	43.97	23.9	18.54
24.6	43.47	21.41	24.7	43.64	27.65	24.7	45.57	28.32	24.8	43.32	43.93	24.9	18.79
25.6	43.58	21.67	25.7	43.95	27.84	25.7	46.77	28.43	25.8	43.49	43.90	25.9	19.07
26.6	43.69	21.96	26.7	44.26	28.06	26.7	48.00	28.56	26.8	43.67	43.89	26.9	19.36
27.6	43.78	22.27	27.7	44.56	28.31	27.7	49.22	28.72	27.8	43.85	43.91	27.9	19.74
28.6	43.86	22.59	28.7	44.83	28.57	28.7	50.37	28.91	28.8	44.03	43.96	28.9	20.16
29.6	43.93	22.92	29.6	45.07	28.84	29.7	51.44	29.11	29.8	44.20	44.03	29.9	20.47
30.6	43.99	23.24	30.6	45.29	29.12	30.7	52.41	29.32	30.8	44.36	44.13	30.9	20.84
31.6	44.03	23.55	31.6	45.48	29.39	31.7	53.28	29.53	31.8	44.52	44.22	31.9	21.18
7.34	+7.27		16.90	+16.87		57.74	+57.73		7.38	+7.31		18.13	
16 <sup>h</sup> 54 <sup>m</sup>	37 <sup>s</sup> .997		17 <sup>h</sup> 59 <sup>m</sup>	40 <sup>s</sup> .30		19 <sup>h</sup> 5 <sup>m</sup>	3 <sup>s</sup> .27		20 <sup>h</sup> 48 <sup>m</sup>	48 <sup>s</sup> .820		23 <sup>h</sup> 27 <sup>m</sup>	
+82° 10'	44'' .05		+86° 36'	51'' .19		+89° 0'	51'' .13		+82° 13'	2'' .89		+86° 50'	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			39 H. Cephei. Mag. 5.6		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
May	h m 16 54	° ' +82 10	May	h m 17 59	° ' +86 36	May	h m 19 4	° ' +89 0	May	h m 20 48	° ' +82 12	May	h m 23 27	° ' +86 50
	s "	"		s "	"		s "	"		s "	"		s "	"
0.6	43.99	23.24	0.6	45.29	29.12	0.7	52.41	29.32	0.8	44.36	44.13	0.9	20.84	12.80
1.6	44.03	23.55	1.6	45.48	29.39	1.7	53.28	29.53	1.8	44.52	44.22	1.9	21.18	12.68
2.6	44.08	23.83	2.6	45.66	29.63	2.7	54.09	29.72	2.8	44.66	44.31	2.9	21.49	12.58
3.6	44.13	24.09	3.6	45.83	29.85	3.7	54.89	29.89	3.8	44.80	44.38	3.9	21.78	12.47
4.6	44.19	24.34	4.6	46.02	30.05	4.7	55.71	30.03	4.8	44.93	44.43	4.9	22.05	12.34
5.6	44.26	24.59	5.6	46.23	30.25	5.7	56.57	30.17	5.7	45.07	44.47	5.9	22.33	12.19
6.6	44.33	24.84	6.6	46.46	30.46	6.7	57.52	30.31	6.7	45.22	44.51	6.9	22.61	12.03
7.6	44.41	25.11	7.6	46.70	30.68	7.7	58.55	30.46	7.7	45.38	44.54	7.9	22.92	11.86
8.6	44.49	25.41	8.6	46.96	30.92	8.7	59.61	30.63	8.7	45.55	44.59	8.9	23.25	11.68
9.6	44.56	25.74	9.6	47.21	31.19	9.7	60.70	30.82	9.7	45.72	44.65	9.8	23.62	11.52
10.6	44.63	26.08	10.6	47.44	31.48	10.7	61.77	31.04	10.7	45.89	44.74	10.8	24.01	11.37
11.6	44.69	26.43	11.6	47.66	31.79	11.7	62.78	31.28	11.7	46.07	44.85	11.8	24.42	11.24
12.6	44.73	26.79	12.6	47.86	32.11	12.7	63.74	31.54	12.7	46.25	44.99	12.8	24.83	11.13
13.6	44.76	27.14	13.6	48.03	32.43	13.7	64.62	31.80	13.7	46.41	45.14	13.8	25.24	11.04
14.6	44.79	27.48	14.6	48.19	32.74	14.7	65.42	32.05	14.7	46.56	45.29	14.8	25.63	10.96
15.6	44.81	27.81	15.6	48.32	33.04	15.6	66.17	32.31	15.7	46.71	45.46	15.8	26.00	10.89
16.6	44.83	28.13	16.6	48.44	33.33	16.6	66.86	32.55	16.7	46.85	45.61	16.8	26.37	10.84
17.6	44.85	28.43	17.6	48.56	33.61	17.6	67.53	32.78	17.7	46.98	45.76	17.8	26.71	10.79
18.6	44.87	28.71	18.6	48.68	33.87	18.6	68.17	33.00	18.7	47.11	45.90	18.8	27.04	10.74
19.5	44.90	28.99	19.6	48.81	34.12	19.6	68.84	33.21	19.7	47.25	46.02	19.8	27.35	10.67
20.5	44.94	29.27	20.6	48.95	34.37	20.6	69.55	33.42	20.7	47.38	46.13	20.8	27.68	10.60
21.5	44.97	29.56	21.6	49.11	34.63	21.6	70.31	33.63	21.7	47.52	46.25	21.8	28.02	10.51
22.5	45.01	29.87	22.6	49.28	34.90	22.6	71.11	33.85	22.7	47.67	46.38	22.8	28.38	10.42
23.5	45.05	30.20	23.6	49.44	35.20	23.6	71.96	34.09	23.7	47.83	46.52	23.8	28.77	10.33
24.5	45.08	30.55	24.6	49.60	35.53	24.6	72.79	34.36	24.7	47.99	46.69	24.8	29.18	10.26
25.5	45.10	30.93	25.6	49.73	35.88	25.6	73.56	34.66	25.7	48.15	46.88	25.8	29.62	10.22
26.5	45.09	31.31	26.6	49.83	36.24	26.6	74.25	34.98	26.7	48.31	47.11	26.8	30.07	10.21
27.5	45.08	31.68	27.6	49.90	36.60	27.6	74.83	35.32	27.7	48.46	47.35	27.8	30.52	10.22
28.5	45.05	32.03	28.6	49.94	36.95	28.6	75.29	35.64	28.7	48.59	47.61	28.8	30.94	10.25
29.5	45.02	32.35	29.6	49.96	37.27	29.6	75.68	35.95	29.7	48.71	47.86	29.8	31.33	10.29
30.5	45.00	32.65	30.6	49.97	37.58	30.6	76.02	36.24	30.7	48.82	48.09	30.8	31.70	10.34
31.5	44.97	32.94	31.6	49.99	37.87	31.6	76.35	36.50	31.7	48.92	48.30	31.8	32.03	10.38
7.34 +7.28			16.91 +16.88			57.82 +57.81			7.38 +7.31			18.12 +18.09		
10 <sup>h</sup> 54 <sup>m</sup> 37 <sup>s</sup> .997			17 <sup>h</sup> 59 <sup>m</sup> 40 <sup>s</sup> .30			19 <sup>h</sup> 5 <sup>m</sup> 3 <sup>s</sup> .27			20 <sup>h</sup> 48 <sup>m</sup> 48 <sup>s</sup> .820			23 <sup>h</sup> 27 <sup>m</sup> 44 <sup>s</sup> .653		
10 <sup>h</sup> 10' 44".05			+86° 36' 51".19			+89° 0' 51".13			+82° 13' 2".89			+86° 50' 19".16		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT

1915

1915

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

β Ursa Minoris. Mag. 4.4		δ Ursa Minoris. Mag. 4.4			λ Ursa Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			89 H. Cephei. Mag. 5.6		
t	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.	Mean Solar Date.	Right Ascension.	Declination North.
n	° ' "		h m s	° ' "		h m s	° ' "		h m s	° ' "		h m s	° ' "
4	+82 10	July	17 59	+86 36	July	19 5	+89 0	July	20 48	+82 12	July	23 27	+86 50
	"		s	"		s	"		s	"		s	"
9	42.05	0.5	49.00	47.46	0.5	22.51	45.88	0.6	51.93	56.53	0.7	43.37	13.10
2	42.30	1.5	48.90	47.74	1.5	22.47	46.18	1.6	52.00	56.82	1.7	43.69	13.24
5	42.57	2.5	48.81	48.04	2.5	22.47	46.49	2.6	52.08	57.11	2.7	44.05	13.38
8	42.86	3.5	48.72	48.36	3.5	22.48	46.82	3.6	52.16	57.42	3.7	44.43	13.53
9	43.16	4.5	48.61	48.70	4.5	22.46	47.17	4.6	52.25	57.75	4.7	44.82	13.69
0	43.47	5.5	48.49	49.05	5.5	22.38	47.54	5.6	52.33	58.10	5.7	45.22	13.87
0	43.78	6.5	48.34	49.40	6.5	22.22	47.91	6.6	52.39	58.47	6.7	45.62	14.07
9	44.08	7.5	48.16	49.74	7.5	21.98	48.28	7.6	52.45	58.84	7.7	46.00	14.29
6	44.35	8.5	47.97	50.07	8.5	21.66	48.64	8.6	52.50	59.22	8.7	46.37	14.52
4	44.61	9.5	47.76	50.38	9.5	21.28	48.99	9.6	52.55	59.60	9.7	46.71	14.77
1	44.85	10.5	47.54	50.68	10.5	20.85	49.34	10.6	52.58	59.97	10.7	47.03	15.02
9	45.06	11.4	47.31	50.97	11.5	20.38	49.66	11.6	52.60	60.32	11.7	47.33	15.28
7	45.27	12.4	47.10	51.23	12.5	19.91	49.97	12.6	52.62	60.66	12.7	47.61	15.52
5	45.46	13.4	46.89	51.48	13.5	19.45	50.26	13.6	52.64	60.98	13.7	47.88	15.75
4	45.65	14.4	46.69	51.73	14.5	19.04	50.54	14.6	52.67	61.30	14.7	48.15	15.97
4	45.85	15.4	46.51	51.98	15.5	18.68	50.83	15.6	52.70	61.61	15.7	48.42	16.18
4	46.07	16.4	46.33	52.25	16.5	18.37	51.13	16.6	52.74	61.92	16.7	48.72	16.39
4	46.31	17.4	46.15	52.53	17.5	18.06	51.45	17.5	52.79	62.25	17.7	49.04	16.60
2	46.55	18.4	45.96	52.83	18.5	17.76	51.78	18.5	52.83	62.61	18.7	49.38	16.82
0	46.82	19.4	45.76	53.15	19.5	17.40	52.13	19.5	52.87	62.99	19.7	49.74	17.07
6	47.08	20.4	45.53	53.49	20.5	16.94	52.50	20.5	52.91	63.39	20.7	50.10	17.34
2	47.33	21.4	45.26	53.81	21.5	16.37	52.88	21.5	52.94	63.80	21.6	50.44	17.64
6	47.55	22.4	44.96	54.11	22.5	15.67	53.24	22.5	52.94	64.22	22.6	50.76	17.96
0	47.75	23.4	44.64	54.39	23.5	14.90	53.59	23.5	52.93	64.63	23.6	51.04	18.30
3	47.92	24.4	44.32	54.64	24.5	14.09	53.91	24.5	52.92	65.02	24.6	51.28	18.62
8	48.06	25.4	44.01	54.86	25.5	13.28	54.20	25.5	52.89	65.38	25.6	51.49	18.94
4	48.20	26.4	43.71	55.07	26.5	12.51	54.47	26.5	52.88	65.72	26.6	51.70	19.23
1	48.33	27.4	43.44	55.28	27.5	11.81	54.73	27.5	52.87	66.05	27.6	51.90	19.51
8	48.48	28.4	43.19	55.49	28.4	11.20	54.99	28.5	52.85	66.37	28.6	52.12	19.77
5	48.64	29.4	42.95	55.72	29.4	10.62	55.27	29.5	52.86	66.70	29.6	52.37	20.03
2	48.82	30.4	42.71	55.96	30.4	10.05	55.57	30.5	52.87	67.03	30.6	52.63	20.29
9	49.01	31.4	42.46	56.23	31.4	9.49	55.88	31.5	52.88	67.39	31.6	52.92	20.56
+7.28		16.93	+16.90	58.12	+58.11	7.38	+7.32	18.13	+18.10				
37°.997		17 <sup>h</sup> 59 <sup>m</sup>	40°.30	19 <sup>h</sup> 5 <sup>m</sup>	3°.27	20 <sup>h</sup> 48 <sup>m</sup>	48°.820	23 <sup>h</sup> 27 <sup>m</sup>	44°.653				
44''.05		+86° 36'	51''.19	+89° 0'	51''.13	+82° 13'	2''.89	+86° 50'	19''.16				



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			78 Draconis. Mag. 5.7			39 H. Cephei. Mag. 5.6		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Aug.	16 54	+82 10	Aug.	17 59	+86 36	Aug.	19 4	+89 0	Aug.	20 48	+82 13	Aug.	23 27	+86 5
	s	"		s	"		s	"		s	"		s	"
0.3	39.79	49.01	0.4	42.46	56.23	0.4	69.49	55.88	0.5	52.88	7.39	0.6	52.92	20.5
1.3	39.65	49.22	1.4	42.19	56.50	1.4	68.87	56.21	1.5	52.89	7.78	1.6	53.22	20.1
2.3	39.50	49.42	2.4	41.90	56.78	2.4	68.19	56.55	2.5	52.89	8.18	2.6	53.51	21.1
3.3	39.33	49.61	3.4	41.59	57.05	3.4	67.42	56.89	3.5	52.88	8.58	3.6	53.79	21.1
4.3	39.17	49.79	4.4	41.27	57.32	4.4	66.59	57.22	4.5	52.87	8.98	4.6	54.05	21.1
5.3	38.99	49.94	5.4	40.92	57.57	5.4	65.69	57.54	5.5	52.84	9.38	5.6	54.29	22
6.3	38.82	50.08	6.4	40.56	57.79	6.4	64.73	57.85	6.5	52.80	9.77	6.6	54.51	22
7.3	38.65	50.19	7.4	40.20	58.00	7.4	63.74	58.13	7.5	52.76	10.15	7.6	54.70	22
8.3	38.48	50.29	8.4	39.84	58.18	8.4	62.74	58.40	8.5	52.71	10.51	8.6	54.87	23
9.3	38.31	50.37	9.4	39.50	58.35	9.4	61.75	58.65	9.5	52.66	10.86	9.6	55.02	23
10.3	38.16	50.44	10.4	39.16	58.51	10.4	60.79	58.89	10.5	52.61	11.19	10.6	55.16	23
11.3	38.01	50.53	11.4	38.84	58.67	11.4	59.87	59.12	11.5	52.56	11.52	11.6	55.31	24
12.3	37.86	50.62	12.4	38.52	58.84	12.4	59.02	59.37	12.5	52.52	11.84	12.6	55.47	24
13.3	37.71	50.72	13.4	38.22	59.03	13.4	58.20	59.62	13.5	52.50	12.16	13.6	55.66	24
14.3	37.56	50.85	14.4	37.91	59.23	14.4	57.39	59.89	14.5	52.47	12.51	14.6	55.87	24
15.3	37.40	50.98	15.4	37.58	59.45	15.4	56.54	60.18	15.5	52.44	12.88	15.6	56.09	24
16.3	37.23	51.12	16.3	37.23	59.68	16.4	55.62	60.49	16.5	52.41	13.27	16.6	56.31	24
17.3	37.05	51.26	17.3	36.86	59.92	17.4	54.60	60.81	17.5	52.38	13.68	17.6	56.53	24
18.3	36.86	51.37	18.3	36.46	60.15	18.4	53.47	61.12	18.5	52.32	14.09	18.6	56.73	24
19.3	36.66	51.46	19.3	36.03	60.34	19.4	52.25	61.41	19.5	52.24	14.50	19.6	56.89	24
20.3	36.47	51.51	20.3	35.60	60.50	20.4	50.96	61.67	20.5	52.16	14.89	20.6	57.02	24
21.3	36.28	51.53	21.3	35.17	60.63	21.4	49.67	61.90	21.5	52.08	15.25	21.6	57.11	24
22.3	36.10	51.53	22.3	34.76	60.74	22.4	48.41	62.11	22.5	51.98	15.58	22.6	57.18	24
23.3	35.92	51.54	23.3	34.37	60.84	23.4	47.22	62.30	23.4	51.89	15.89	23.6	57.24	24
24.3	35.76	51.55	24.3	34.00	60.95	24.4	46.10	62.49	24.4	51.81	16.19	24.6	57.32	24
25.3	35.61	51.58	25.3	33.65	61.07	25.4	45.05	62.70	25.4	51.75	16.50	25.6	57.42	24
26.3	35.45	51.63	26.3	33.31	61.21	26.4	44.05	62.92	26.4	51.69	16.81	26.6	57.54	24
27.3	35.29	51.68	27.3	32.96	61.36	27.4	43.04	63.15	27.4	51.62	17.13	27.5	57.67	24
28.3	35.12	51.75	28.3	32.60	61.52	28.4	41.99	63.39	28.4	51.56	17.47	28.5	57.82	30
29.3	34.95	51.83	29.3	32.22	61.69	29.4	40.90	63.64	29.4	51.51	17.83	29.5	57.97	30
30.3	34.76	51.89	30.3	31.83	61.85	30.4	39.74	63.90	30.4	51.43	18.21	30.5	58.10	30
31.3	34.57	51.93	31.3	31.41	62.01	31.4	38.50	64.15	31.4	51.35	18.57	31.5	58.23	30
7.35 +7.28			16.94 +16.91			58.27 +58.26			7.39 +7.32			18.14 +18.14		
16 <sup>h</sup> 54 <sup>m</sup> 37 <sup>s</sup> .997			17 <sup>h</sup> 59 <sup>m</sup> 40 <sup>s</sup> .30			19 <sup>h</sup> 5 <sup>m</sup> 3 <sup>s</sup> .27			20 <sup>h</sup> 48 <sup>m</sup> 48 <sup>s</sup> .820			23 <sup>h</sup> 27 <sup>m</sup> 44 <sup>s</sup> .		
+82° 10' 44".05			+86° 36' 51".19			+89° 0' 51".13			+82° 13' 2".89			+86° 50' 19".		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			39 H. Cephei. Mag. 5.6		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Sept.	16 54	+82 10	Sept.	17 59	+86 37	Sept.	19 3	+89 1	Sept.	20 48	+82 13	Sept.	23 27	+86 50
	s	"		s	"		s	"		s	"		s	"
0.3	34.57	51.93	0.3	31.41	2.01	0.4	98.50	4.15	0.4	51.35	18.57	0.5	58.23	31.43
1.3	34.38	51.96	1.3	30.98	2.14	1.4	97.19	4.39	1.4	51.26	18.93	1.5	58.33	31.84
2.3	34.18	51.97	2.3	30.54	2.26	2.3	95.84	4.61	2.4	51.16	19.29	2.5	58.41	32.26
3.3	33.99	51.96	3.3	30.09	2.36	3.3	94.46	4.81	3.4	51.05	19.64	3.5	58.45	32.66
4.3	33.80	51.92	4.3	29.64	2.44	4.3	93.05	4.99	4.4	50.94	19.97	4.5	58.48	33.06
5.2	33.61	51.87	5.3	29.20	2.49	5.3	91.66	5.16	5.4	50.82	20.27	5.5	58.49	33.45
6.2	33.43	51.82	6.3	28.78	2.54	6.3	90.31	5.31	6.4	50.70	20.56	6.5	58.48	33.83
7.2	33.26	51.76	7.3	28.37	2.58	7.3	88.98	5.45	7.4	50.59	20.84	7.5	58.47	34.20
8.2	33.10	51.71	8.3	27.98	2.63	8.3	87.72	5.59	8.4	50.49	21.12	8.5	58.48	34.55
9.2	32.94	51.68	9.3	27.61	2.69	9.3	86.52	5.74	9.4	50.39	21.39	9.5	58.50	34.90
10.2	32.77	51.65	10.3	27.23	2.77	10.3	85.34	5.91	10.4	50.30	21.68	10.5	58.54	35.25
11.2	32.60	51.65	11.3	26.85	2.86	11.3	84.15	6.10	11.4	50.21	21.99	11.5	58.61	35.61
12.2	32.42	51.66	12.3	26.45	2.97	12.3	82.91	6.30	12.4	50.12	22.31	12.5	58.69	35.99
13.2	32.23	51.66	13.3	26.01	3.08	13.3	81.59	6.52	13.4	50.02	22.65	13.5	58.76	36.40
14.2	32.03	51.64	14.3	25.55	3.18	14.3	80.16	6.73	14.4	49.91	23.01	14.5	58.81	36.83
15.2	31.83	51.59	15.3	25.07	3.26	15.3	78.64	6.93	15.4	49.79	23.35	15.5	58.82	37.27
16.2	31.62	51.52	16.3	24.58	3.31	16.3	77.05	7.10	16.4	49.65	23.67	16.5	58.80	37.71
17.2	31.41	51.42	17.3	24.10	3.32	17.3	75.44	7.23	17.4	49.50	23.98	17.5	58.75	38.15
18.2	31.22	51.30	18.3	23.63	3.31	18.3	73.85	7.34	18.4	49.35	24.26	18.5	58.67	38.56
19.2	31.04	51.17	19.3	23.19	3.29	19.3	72.34	7.42	19.4	49.20	24.51	19.5	58.58	38.95
20.2	30.88	51.04	20.3	22.77	3.27	20.3	70.90	7.50	20.4	49.06	24.74	20.5	58.49	39.32
21.2	30.71	50.92	21.3	22.36	3.26	21.3	69.55	7.59	21.4	48.93	24.97	21.5	58.42	39.67
22.2	30.55	50.82	22.2	21.97	3.25	22.3	68.25	7.68	22.4	48.82	25.20	22.5	58.37	40.00
23.2	30.39	50.74	23.2	21.58	3.27	23.3	66.97	7.80	23.4	48.71	25.44	23.5	58.34	40.35
24.2	30.23	50.67	24.2	21.18	3.29	24.3	65.68	7.93	24.4	48.60	25.70	24.5	58.34	40.71
25.2	30.06	50.60	25.2	20.77	3.33	25.3	64.35	8.06	25.4	48.48	25.97	25.5	58.33	41.09
26.2	29.88	50.53	26.2	20.35	3.36	26.3	62.97	8.19	26.4	48.35	26.25	26.5	58.31	41.47
27.2	29.70	50.45	27.2	19.91	3.39	27.3	61.51	8.33	27.4	48.22	26.54	27.5	58.28	41.86
28.2	29.51	50.35	28.2	19.44	3.40	28.3	59.99	8.46	28.3	48.08	26.82	28.5	58.23	42.27
29.2	29.32	50.23	29.2	18.97	3.40	29.3	58.43	8.57	29.3	47.94	27.09	29.5	58.16	42.69
30.2	29.13	50.08	30.2	18.51	3.37	30.3	56.83	8.67	30.3	47.79	27.35	30.5	58.07	43.10
31.2	28.95	49.92	31.2	18.05	3.32	31.3	55.22	8.74	31.3	47.62	27.60	31.5	57.93	43.50
7.35 +7.28			16.95 +16.92			58.38 +58.38			7.39 +7.32			18.16 +18.14		
16 <sup>h</sup> 54 <sup>m</sup> 37 <sup>s</sup> .997			17 <sup>h</sup> 59 <sup>m</sup> 40 <sup>s</sup> .30			19 <sup>h</sup> 5 <sup>m</sup> 3 <sup>s</sup> .27			20 <sup>h</sup> 48 <sup>m</sup> 48 <sup>s</sup> .820			23 <sup>h</sup> 27 <sup>m</sup> 44 <sup>s</sup> .653		
+82° 10' 44".05			+86° 36' 51".19			+89° 0' 51".13			+82° 13' 2".89			+86° 50' 19".16		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			76 Draconis. Mag. 5.7			39 H. Cephe Mag. 5.6		
Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	Decli- nation North.	Mean Solar Date.	Right Ascen- sion.	I n A
Oct.	h m 16 54	° ' +82 10	Oct.	h m 17 59	° ' +86 36	Oct.	h m 19 3	° ' +89 1	Oct.	h m 20 48	° ' +82 13	Oct.	h m 23 27	+
	s "	"		s "	"		s "	"		s "	"		s "	
0.2	29.13	50.08	0.2	18.51	63.37	0.3	56.83	8.67	0.3	47.79	27.35	0.5	58.07	
1.2	28.95	49.92	1.2	18.05	63.32	1.3	55.22	8.74	1.3	47.62	27.60	1.5	57.93	
2.2	28.78	49.75	2.2	17.59	63.25	2.3	53.62	8.79	2.3	47.45	27.82	2.4	57.79	
3.2	28.60	49.55	3.2	17.14	63.17	3.3	52.05	8.82	3.3	47.29	28.02	3.4	57.63	
4.2	28.44	49.35	4.2	16.72	63.08	4.3	50.52	8.83	4.3	47.13	28.20	4.4	57.47	
5.2	28.29	49.16	5.2	16.31	62.99	5.3	49.06	8.85	5.3	46.97	28.38	5.4	57.31	
6.2	28.14	48.98	6.2	15.92	62.90	6.3	47.66	8.87	6.3	46.82	28.55	6.4	57.16	
7.2	28.00	48.82	7.2	15.54	62.84	7.3	46.31	8.90	7.3	46.68	28.73	7.4	57.03	
8.2	27.84	48.68	8.2	15.15	62.79	8.2	44.97	8.95	8.3	46.55	28.93	8.4	56.93	
9.2	27.69	48.54	9.2	14.74	62.75	9.2	43.59	9.02	9.3	46.41	29.14	9.4	56.85	
10.2	27.53	48.41	10.2	14.32	62.73	10.2	42.17	9.11	10.3	46.27	29.37	10.4	56.77	
11.2	27.35	48.27	11.2	13.88	62.70	11.2	40.65	9.19	11.3	46.12	29.61	11.4	56.67	
12.1	27.17	48.10	12.2	13.42	62.65	12.2	39.03	9.26	12.3	45.96	29.85	12.4	56.55	
13.1	26.98	47.90	13.2	12.94	62.58	13.2	37.34	9.31	13.3	45.78	30.08	13.4	56.39	
14.1	26.80	47.68	14.2	12.46	62.48	14.2	35.63	9.32	14.3	45.60	30.29	14.4	56.19	
15.1	26.62	47.44	15.2	12.00	62.35	15.2	33.93	9.31	15.3	45.41	30.46	15.4	55.96	
16.1	26.47	47.18	16.2	11.56	62.19	16.2	32.29	9.27	16.3	45.23	30.60	16.4	55.72	
17.1	26.33	46.91	17.2	11.15	62.02	17.2	30.74	9.22	17.3	45.05	30.72	17.4	55.47	
18.1	26.19	46.66	18.2	10.77	61.86	18.2	29.29	9.16	18.3	44.88	30.83	18.4	55.24	
19.1	26.07	46.42	19.2	10.40	61.72	19.2	27.91	9.11	19.3	44.72	30.94	19.4	55.02	
20.1	25.94	46.21	20.2	10.04	61.59	20.2	26.58	9.08	20.3	44.57	31.06	20.4	54.83	
21.1	25.80	46.01	21.2	9.69	61.48	21.2	25.26	9.07	21.3	44.42	31.19	21.4	54.66	
22.1	25.67	45.82	22.2	9.32	61.38	22.2	23.92	9.07	22.3	44.28	31.33	22.4	54.50	
23.1	25.54	45.63	23.2	8.94	61.28	23.2	22.53	9.07	23.3	44.13	31.49	23.4	54.33	
24.1	25.39	45.43	24.2	8.54	61.17	24.2	21.09	9.07	24.3	43.97	31.65	24.4	54.16	
25.1	25.24	45.21	25.2	8.13	61.06	25.2	19.58	9.07	25.3	43.80	31.81	25.4	53.98	
26.1	25.08	44.97	26.2	7.71	60.93	26.2	18.04	9.05	26.3	43.63	31.95	26.4	53.76	
27.1	24.93	44.72	27.2	7.29	60.77	27.2	16.47	9.01	27.3	43.45	32.08	27.4	53.52	
28.1	24.79	44.44	28.1	6.88	60.60	28.2	14.88	8.95	28.3	43.27	32.19	28.4	53.26	
29.1	24.65	44.15	29.1	6.47	60.41	29.2	13.31	8.87	29.3	43.08	32.29	29.4	52.97	
30.1	24.52	43.84	30.1	6.08	60.20	30.2	11.77	8.77	30.3	42.89	32.37	30.4	52.67	
31.1	24.39	43.53	31.1	5.71	59.98	31.2	10.28	8.65	31.3	42.71	32.42	31.4	52.37	
7.35 +7.28			16.95 +16.92			58.42 +58.42			7.39 +7.32			18.18		
16 <sup>h</sup> 54 <sup>m</sup> 37 <sup>s</sup> .997			17 <sup>h</sup> 59 <sup>m</sup> 40 <sup>s</sup> .30			19 <sup>h</sup> 5 <sup>m</sup> 3 <sup>s</sup> .27			20 <sup>h</sup> 48 <sup>m</sup> 48 <sup>s</sup> .820			23 <sup>h</sup> 27 <sup>m</sup>		
+82° 10' 44".05			+86° 36' 51".19			+89° 0' 51".13			+82° 13' 2".89			+86° 50'		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Ursæ Minoris. Mag. 4.4			δ Ursæ Minoris. Mag. 4.4			λ Ursæ Minoris. Mag. 6.6			78 Draconis. Mag. 5.7			39 H. Cephei. Mag. 5.6		
Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.	Mean Solar Date.	Right Ascen- sion.	Declina- tion North.
Nov.	h m 16 54	° ' +82 10	Nov.	h m 17 58	° ' +86 36	Nov.	h m 19 2	° ' +89 1	Nov.	h m 20 48	° ' +82 13	Nov.	h m 23 27	° ' +86 50
	s "	"		s "	"		s "	"		s "	"		s "	"
0.1	24.39	43.53	0.1	65.71	59.98	0.2	70.28	8.65	0.3	42.71	32.42	0.4	52.37	53.97
1.1	24.28	43.22	1.1	65.35	59.76	1.2	68.86	8.53	1.3	42.52	32.46	1.4	52.07	54.25
2.1	24.17	42.92	2.1	65.02	59.55	2.2	67.51	8.41	2.3	42.35	32.50	2.4	51.78	54.51
3.1	24.07	42.64	3.1	64.70	59.34	3.2	66.22	8.30	3.3	42.18	32.53	3.4	51.50	54.76
4.1	23.97	42.38	4.1	64.39	59.15	4.2	64.96	8.20	4.2	42.02	32.57	4.4	51.25	55.01
5.1	23.86	42.13	5.1	64.06	58.98	5.2	63.70	8.12	5.2	41.87	32.64	5.4	51.01	55.27
6.1	23.75	41.89	6.1	63.72	58.83	6.2	62.40	8.06	6.2	41.72	32.73	6.4	50.79	55.55
7.1	23.63	41.64	7.1	63.37	58.67	7.2	61.02	8.00	7.2	41.56	32.82	7.4	50.56	55.85
8.1	23.50	41.38	8.1	63.00	58.50	8.2	59.56	7.94	8.2	41.40	32.92	8.3	50.32	56.17
9.1	23.37	41.09	9.1	62.60	58.31	9.2	58.04	7.86	9.2	41.22	33.01	9.3	50.04	56.49
10.1	23.23	40.78	10.1	62.20	58.09	10.2	56.47	7.75	10.2	41.03	33.08	10.3	49.72	56.81
11.1	23.11	40.43	11.1	61.81	57.84	11.2	54.91	7.61	11.2	40.82	33.12	11.3	49.37	57.12
12.1	23.00	40.07	12.1	61.45	57.57	12.2	53.40	7.43	12.2	40.62	33.12	12.3	49.00	57.40
13.1	22.90	39.71	13.1	61.12	57.29	13.1	51.99	7.24	13.2	40.43	33.10	13.3	48.62	57.64
14.1	22.83	39.35	14.1	60.82	57.00	14.1	50.68	7.04	14.2	40.26	33.06	14.3	48.25	57.86
15.1	22.76	39.01	15.1	60.55	56.72	15.1	49.47	6.86	15.2	40.09	33.01	15.3	47.90	58.06
16.1	22.69	38.69	16.1	60.29	56.47	16.1	48.33	6.68	16.2	39.92	32.98	16.3	47.58	58.26
17.0	22.62	38.39	17.1	60.04	56.23	17.1	47.23	6.52	17.2	39.77	32.95	17.3	47.27	58.45
18.0	22.55	38.11	18.1	59.78	56.01	18.1	46.12	6.38	18.2	39.63	32.94	18.3	46.99	58.65
19.0	22.48	37.83	19.1	59.52	55.79	19.1	44.99	6.24	19.2	39.48	32.94	19.3	46.72	58.86
20.0	22.39	37.54	20.1	59.24	55.57	20.1	43.81	6.11	20.2	39.32	32.93	20.3	46.43	59.08
21.0	22.30	37.24	21.1	58.95	55.35	21.1	42.59	5.97	21.2	39.16	32.94	21.3	46.13	59.31
22.0	22.22	36.93	22.1	58.64	55.11	22.1	41.32	5.82	22.2	38.99	32.93	22.3	45.81	59.55
23.0	22.14	36.59	23.1	58.34	54.85	23.1	40.02	5.65	23.2	38.81	32.92	23.3	45.46	59.78
24.0	22.05	36.24	24.1	58.05	54.57	24.1	38.72	5.46	24.2	38.63	32.89	24.3	45.09	60.00
25.0	21.98	35.87	25.1	57.76	54.27	25.1	37.44	5.25	25.2	38.45	32.83	25.3	44.71	60.21
26.0	21.92	35.51	26.1	57.49	53.96	26.1	36.20	5.02	26.2	38.27	32.75	26.3	44.32	60.40
27.0	21.86	35.13	27.1	57.24	53.63	27.1	35.00	4.77	27.2	38.09	32.65	27.3	43.91	60.58
28.0	21.82	34.75	28.1	57.01	53.30	28.1	33.88	4.52	28.2	37.92	32.54	28.3	43.50	60.73
29.0	21.79	34.37	29.1	56.81	52.97	29.1	32.83	4.26	29.2	37.76	32.42	29.3	43.09	60.86
30.0	21.76	34.01	30.1	56.63	52.66	30.1	31.87	4.01	30.2	37.61	32.30	30.3	42.71	60.98
31.0	21.73	33.67	31.1	56.45	52.37	31.1	30.96	3.78	31.2	37.47	32.18	31.3	42.35	61.10
7.35 +7.28			16.94 +16.91			58.38 +58.37			7.39 +7.33			18.19 +18.17		
16 <sup>h</sup> 54 <sup>m</sup> 37 <sup>s</sup> .997			17 <sup>h</sup> 59 <sup>m</sup> 40 <sup>s</sup> .30			19 <sup>h</sup> 5 <sup>m</sup> 3 <sup>s</sup> .27			20 <sup>h</sup> 48 <sup>m</sup> 48 <sup>s</sup> .820			23 <sup>h</sup> 27 <sup>m</sup> 44 <sup>s</sup> .653		
+82° 10' 44".05			+86° 36' 51".19			+89° 0' 51".13			+82° 13' 2".89			+86° 50' 19".16		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	33 Piscium. Mag. 4.7		$\alpha$ Andromedæ. (Alpheratz.) Mag. 2.2		$\beta$ Cassiopeiæ. Mag. 2.4		$\epsilon$ Phœnicis. Mag. 3.9	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 0 0 s	° ' " — 6 10 "	h m 0 3 s	° ' " + 28 37 "	h m 0 4 s	° ' " + 58 40 "	h m 0 5 s	° ' " — 46 12 "
Jan. 0.2	59.52	58.9	59.53	28.5	37.47	71.9	6.79	71.2
10.2	59.42 <sup>10</sup>	59.4 <sup>5</sup>	59.40 <sup>13</sup>	27.6 <sup>9</sup>	37.17 <sup>30</sup>	71.2 <sup>7</sup>	6.60 <sup>19</sup>	70.8 <sup>4</sup>
20.2	59.33 <sup>9</sup>	59.8 <sup>4</sup>	59.28 <sup>12</sup>	26.5 <sup>11</sup>	36.88 <sup>29</sup>	70.0 <sup>12</sup>	6.42 <sup>18</sup>	69.9 <sup>9</sup>
30.1	59.25 <sup>8</sup>	60.1 <sup>3</sup>	59.17 <sup>11</sup>	25.2 <sup>13</sup>	36.62 <sup>26</sup>	68.4 <sup>16</sup>	6.26 <sup>16</sup>	68.6 <sup>13</sup>
Feb. 9.1	59.18 <sup>7</sup>	60.3 <sup>2</sup>	59.07 <sup>10</sup>	23.7 <sup>15</sup>	36.39 <sup>23</sup>	66.3 <sup>21</sup>	6.14 <sup>12</sup>	66.9 <sup>17</sup>
	4	1	6	16	18	24	10	20
19.1	59.14	60.2	59.01	22.1	36.21	63.9	6.04	64.9
Mar. 1.1	59.12 <sup>2</sup>	60.0 <sup>2</sup>	58.97 <sup>4</sup>	20.5 <sup>16</sup>	36.09 <sup>12</sup>	61.4 <sup>25</sup>	5.98 <sup>6</sup>	62.5 <sup>24</sup>
11.0	59.13 <sup>1</sup>	59.5 <sup>5</sup>	58.97 <sup>0</sup>	19.0 <sup>15</sup>	36.04 <sup>5</sup>	58.7 <sup>27</sup>	5.97 <sup>1</sup>	59.8 <sup>27</sup>
21.0	59.18 <sup>5</sup>	58.8 <sup>7</sup>	59.01 <sup>4</sup>	17.6 <sup>14</sup>	36.07 <sup>3</sup>	56.0 <sup>27</sup>	6.00 <sup>3</sup>	56.9 <sup>29</sup>
31.0	59.26 <sup>8</sup>	57.9 <sup>9</sup>	59.10 <sup>9</sup>	16.5 <sup>11</sup>	36.17 <sup>10</sup>	53.5 <sup>25</sup>	6.08 <sup>8</sup>	53.9 <sup>30</sup>
	13	12	13	9	19	23	13	32
Apr. 10.0	59.39	56.7	59.23	15.6	36.36	51.2	6.21	50.7
19.9	59.55 <sup>16</sup>	55.3 <sup>14</sup>	59.41 <sup>18</sup>	15.0 <sup>6</sup>	36.62 <sup>26</sup>	49.3 <sup>19</sup>	6.39 <sup>18</sup>	47.6 <sup>31</sup>
29.9	59.75 <sup>20</sup>	53.7 <sup>16</sup>	59.63 <sup>22</sup>	14.9 <sup>1</sup>	36.95 <sup>33</sup>	47.8 <sup>15</sup>	6.62 <sup>23</sup>	44.4 <sup>32</sup>
May 9.9	59.98 <sup>23</sup>	51.9 <sup>18</sup>	59.89 <sup>26</sup>	15.1 <sup>2</sup>	37.34 <sup>39</sup>	46.7 <sup>11</sup>	6.90 <sup>28</sup>	41.3 <sup>31</sup>
19.8	60.25 <sup>27</sup>	49.9 <sup>20</sup>	60.19 <sup>30</sup>	15.7 <sup>6</sup>	37.79 <sup>45</sup>	46.1 <sup>6</sup>	7.22 <sup>32</sup>	38.4 <sup>29</sup>
	29	20	32	10	48	1	36	26
29.8	60.54	47.9	60.51	16.7	38.27	46.0	7.58	35.8
June 8.8	60.85 <sup>31</sup>	45.7 <sup>22</sup>	60.86 <sup>35</sup>	18.0 <sup>13</sup>	38.78 <sup>51</sup>	46.5 <sup>5</sup>	7.96 <sup>38</sup>	33.4 <sup>24</sup>
18.8	61.17 <sup>32</sup>	43.6 <sup>21</sup>	61.21 <sup>35</sup>	19.7 <sup>17</sup>	39.31 <sup>53</sup>	47.5 <sup>10</sup>	8.37 <sup>41</sup>	31.3 <sup>21</sup>
28.7	61.49 <sup>32</sup>	41.5 <sup>21</sup>	61.56 <sup>35</sup>	21.6 <sup>19</sup>	39.83 <sup>52</sup>	49.0 <sup>15</sup>	8.78 <sup>41</sup>	29.7 <sup>16</sup>
July 8.7	61.81 <sup>32</sup>	39.5 <sup>20</sup>	61.91 <sup>35</sup>	23.8 <sup>22</sup>	40.34 <sup>51</sup>	50.9 <sup>19</sup>	9.19 <sup>41</sup>	28.5 <sup>12</sup>
	30	18	33	24	48	23	39	8
18.7	62.11	37.7	62.24	26.2	40.82	53.2	9.58	27.7
28.7	62.40 <sup>29</sup>	36.1 <sup>16</sup>	62.54 <sup>30</sup>	28.7 <sup>25</sup>	41.26 <sup>44</sup>	55.9 <sup>27</sup>	9.95 <sup>37</sup>	27.5 <sup>2</sup>
Aug. 7.6	62.65 <sup>25</sup>	34.7 <sup>14</sup>	62.82 <sup>28</sup>	31.2 <sup>25</sup>	41.66 <sup>40</sup>	58.9 <sup>30</sup>	10.29 <sup>34</sup>	27.7 <sup>2</sup>
17.6	62.88 <sup>23</sup>	33.5 <sup>12</sup>	63.06 <sup>24</sup>	33.8 <sup>26</sup>	42.00 <sup>34</sup>	62.1 <sup>32</sup>	10.59 <sup>30</sup>	28.3 <sup>6</sup>
27.6	63.07 <sup>19</sup>	32.6 <sup>9</sup>	63.26 <sup>20</sup>	36.3 <sup>25</sup>	42.29 <sup>29</sup>	65.5 <sup>34</sup>	10.83 <sup>24</sup>	29.4 <sup>11</sup>
	15	6	16	24	22	34	19	15
Sept. 6.5	63.22	32.0	63.42	38.7	42.51	68.9	11.02	30.9
16.5	63.33 <sup>11</sup>	31.6 <sup>4</sup>	63.54 <sup>12</sup>	41.0 <sup>23</sup>	42.67 <sup>16</sup>	72.4 <sup>35</sup>	11.16 <sup>14</sup>	32.7 <sup>18</sup>
26.5	63.40 <sup>7</sup>	31.5 <sup>1</sup>	63.62 <sup>8</sup>	43.2 <sup>22</sup>	42.76 <sup>9</sup>	75.8 <sup>34</sup>	11.24 <sup>8</sup>	34.8 <sup>21</sup>
Oct. 6.5	63.43 <sup>3</sup>	31.7 <sup>2</sup>	63.66 <sup>4</sup>	45.1 <sup>19</sup>	42.80 <sup>4</sup>	79.1 <sup>33</sup>	11.26 <sup>2</sup>	37.0 <sup>22</sup>
16.4	63.44 <sup>1</sup>	32.0 <sup>3</sup>	63.66 <sup>0</sup>	46.8 <sup>17</sup>	42.77 <sup>3</sup>	82.2 <sup>31</sup>	11.23 <sup>3</sup>	39.3 <sup>23</sup>
	3	5	2	14	8	28	8	23
26.4	63.41	32.5	63.64	48.2	42.69	85.0	11.15	41.6
Nov. 5.4	63.36 <sup>5</sup>	33.1 <sup>6</sup>	63.59 <sup>5</sup>	49.3 <sup>11</sup>	42.55 <sup>14</sup>	87.6 <sup>26</sup>	11.03 <sup>12</sup>	43.7 <sup>21</sup>
15.4	63.29 <sup>7</sup>	33.8 <sup>7</sup>	63.51 <sup>8</sup>	50.2 <sup>9</sup>	42.37 <sup>18</sup>	89.7 <sup>21</sup>	10.88 <sup>15</sup>	45.6 <sup>19</sup>
25.3	63.20 <sup>9</sup>	34.5 <sup>7</sup>	63.41 <sup>10</sup>	50.7 <sup>5</sup>	42.15 <sup>22</sup>	91.4 <sup>17</sup>	10.70 <sup>18</sup>	47.2 <sup>16</sup>
Dec. 5.3	63.11 <sup>9</sup>	35.3 <sup>8</sup>	63.30 <sup>11</sup>	51.0 <sup>3</sup>	41.90 <sup>25</sup>	92.7 <sup>13</sup>	10.51 <sup>19</sup>	48.5 <sup>13</sup>
	10	7	12	1	28	7	21	8
15.3	63.01	36.0	63.18	50.9	41.62	93.4	10.30	49.3
25.2	62.90 <sup>11</sup>	36.7 <sup>7</sup>	63.05 <sup>13</sup>	50.5 <sup>4</sup>	41.33 <sup>29</sup>	93.6 <sup>2</sup>	10.09 <sup>21</sup>	49.7 <sup>4</sup>
35.2	62.80 <sup>10</sup>	37.3 <sup>6</sup>	62.92 <sup>13</sup>	49.8 <sup>7</sup>	41.03 <sup>30</sup>	93.3 <sup>3</sup>	9.89 <sup>20</sup>	49.6 <sup>1</sup>
Sec $\delta$ , Tan $\delta$	1.006	−0.108	1.139	+0.546	1.924	+1.644	1.445	−1.043
Mean Place	59°.112	59''.04	59°.450	16''.23	38°.056	51''.55	5°.987	59''.41
$D_{\uparrow} \alpha$ , $D_{\downarrow} \alpha$	0.00	+0.01	0.00	−0.04	0.00	−0.11	0.00	+0.07
$D_{\uparrow} \delta$ , $D_{\downarrow} \delta$	+0.4	0.0	+0.4	0.0	+0.4	0.0	+0.4	0.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	22 Andromedæ. Mag. 5.1		γ Pegasi. Mag. 2.9		σ Andromedæ. Mag. 4.5		ι Ceti. Mag. 3.8	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 0 5 s	° ' " +45 35 "	h m 0 8 s	° ' " +14 42 "	h m 0 13 s	° ' " +36 18 "	h m 0 15 s	° ' " - 9 17 "
Jan. 0.2	53.71	74.7 8	51.69	47.6 8	53.05	65.4 8	6.36	42.6 6
10.2	53.52 19	73.9 12	51.58 11	46.8 8	52.89 16	64.6 8	6.25 11	43.2 6
20.2	53.33 19	72.7 16	51.48 10	45.9 9	52.74 15	63.5 11	6.15 10	43.5 3
30.2	53.16 17	71.1 16	51.39 9	44.9 10	52.61 13	62.1 14	6.06 9	43.7 2
Feb. 9.1	53.02 14 11	69.2 19 21	51.31 8 6	43.9 10 10	52.49 12 9	60.5 16 18	5.99 7 5	43.7 0 2
19.1	52.91	67.1	51.25	42.9	52.40	58.7	5.94	43.5
Mar. 1.1	52.84 7	64.9 22	51.22 3	42.0 9	52.34 6	56.8 19	5.91 3	43.1 4
11.0	52.82 2	62.7 22	51.22 0	41.3 7	52.32 2	55.0 18	5.90 1	42.4 7
21.0	52.85 3	60.5 22	51.26 4	40.7 6	52.34 2	53.3 17	5.93 3	41.6 8
31.0	52.94 9 15	58.5 20 17	51.34 8 12	40.4 3 1	52.42 8 13	51.7 16 13	6.00 7 11	40.5 11 14
Apr. 10.0	53.09	56.8	51.46	40.3	52.55	50.4	6.11	39.1
19.9	53.29 20	55.4 14	51.62 16	40.5 2	52.73 18	49.4 10	6.25 14	37.5 16
29.9	53.56 27	54.4 10	51.82 20	41.0 5	52.96 23	48.8 6	6.44 19	35.8 17
May 9.9	53.87 31	53.8 6	52.06 24	41.9 9	53.23 27	48.6 2	6.66 22	33.9 19
19.8	54.22 35 38	53.7 1 4	52.33 27 30	43.0 11 14	53.54 31 34	48.8 2 7	6.92 26 28	31.8 21 22
29.8	54.60	54.1 8	52.63	44.4	53.88	49.5	7.20	29.6
June 8.8	55.00 40	54.9 13	52.95 32	46.1 17	54.24 36	50.5 10	7.51 31	27.5 21
18.8	55.42 42	56.2 17	53.28 33	48.0 19	54.61 37	51.9 14	7.83 32	25.3 21
28.7	55.83 41	57.9 21	53.61 33	50.1 21	54.99 38	53.7 18	8.15 32	23.2 20
July 8.7	56.24 41 38	60.0 21 24	53.93 32 31	52.2 21 22	55.36 37 35	55.8 21 23	8.47 32 31	21.2 20 17
18.7	56.62	62.4	54.24	54.4	55.71	58.1	8.78	19.5
28.7	56.98 36	65.1 27	54.53 29	56.6 22	56.04 33	60.7 26	9.08 30	17.9
Aug. 7.6	57.30 32	68.0 29	54.80 27	58.8 22	56.34 30	63.3 26	9.34 26	16.6
17.6	57.58 28	71.0 30	55.03 23	60.9 21	56.60 26	66.1 28	9.58 24	15.5
27.6	57.81 23 19	74.0 30 31	55.22 19 16	62.8 19 17	56.83 23 18	68.8 27 28	9.78 20 16	14.8
Sept. 6.5	58.00	77.1	55.38	64.5	57.01	71.6	9.94	14.3
16.5	58.13 13	80.2 31	55.50 12	66.1 16	57.14 13	74.2 26	10.07 13	14.1
26.5	58.22 9	83.1 29	55.58 8	67.4 13	57.24 10	76.7 25	10.15 8	14.2
Oct. 6.5	58.26 4	85.9 28	55.63 5	68.6 12	57.29 5	79.0 23	10.20 5	14.6
16.4	58.26 0 5	88.4 25 23	55.64 1 1	69.5 0 6	57.30 1 2	81.1 21 19	10.22 2 2	15.1
26.4	58.21 8	90.7	55.63	70.1	57.28	83.0	10.20	15.8
Nov. 5.4	58.13 11	92.7 20 17	55.59 4 6	70.6 5 2	57.23 5 8	84.6 16 12	10.16 4 6	16.6
15.4	58.02 14	94.4 12 8	55.53 8 10	70.8 0 2	57.15 10 12	85.8 10 5	10.10 8 9	17.4
25.3	57.88 16 18	95.6 8 4	55.45 10 10	70.8 2 4	57.05 12 14	86.8 10 2	10.02 8 10	18.3
Dec. 5.3	57.72	96.4	55.35	70.6	56.93	87.3	9.93	19.2
15.3	57.54	96.8	55.25	70.2	56.79	87.5	9.83	20.0
25.2	57.35 19	96.7 1	55.14 11	69.7 5	56.64 15	87.3 2	9.72 11	20.7
35.2	57.15 20	96.2 5	55.03 11	68.9 8	56.49 15	86.7 6	9.62 10	21.3
Sec δ, Tan δ	1.429	+1.021	1.034	+0.263	1.241	+0.735	1.013	-0.16
Mean Place	53°.898	57''.38	51°.420	39''.81	52°.995	50''.41	5°.845	42''.12
D'ψ a, Dω a	0.00	-0.07	0.00	-0.02	0.00	-0.05	0.00	+0.01
Dψ δ, Dω δ	+0.4	0.0	+0.4	0.0	+0.4	+0.1	+0.4	+0.1

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ζ Tucanae. Mag. 4.3		44 Piscium. Mag. 6.0		β Hydri. Mag. 2.9		α Phoenicis. Mag. 2.4	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.
	h m 0 15 s	° ' " —65 21 "	h m 0 21 s	° ' " + 1 28 "	h m 0 21 s	° ' " —77 43 "	h m 0 22 s	° ' " —42 45 "
Jan. 0.2	40.50	101.3	3.15	11.7	20.53	74.6	6.05	73.8
10.2	40.10 40	100.4 9	3.04 11	11.1 6	19.63 90	73.5 11	5.87 18	73.7 1
20.2	39.73 37	99.0 14	2.94 10	10.5 6	18.79 84	71.9 16	5.70 17	73.1 6
30.2	39.39 34	97.1 19	2.85 9	10.0 5	18.02 77	69.7 22	5.54 16	72.1 10
Feb. 9.1	39.11 28	94.7 24	2.78 7	9.5 5	17.36 66	67.0 27	5.40 14	70.7 14
	23	28	6	3	55	31	10	18
19.1	38.88	91.9	2.72	9.2	16.81	63.9	5.30	68.9
Mar. 1.1	38.72 16	88.8 31	2.68 4	9.0 2	16.39 42	60.5 34	5.22 8	66.7 22
11.0	38.62 10	85.4 34	2.67 1	9.0 0	16.12 27	56.8 37	5.19 3	64.3 24
21.0	38.61 1	81.8 36	2.70 3	9.2 2	16.00 12	53.0 38	5.19 0	61.6 27
31.0	38.67 6	78.1 37	2.76 6	9.6 4	16.04 4	49.1 39	5.25 6	58.7 29
	15	38	10	7	19	39	10	30
Apr. 10.0	38.82	74.3	2.86	10.3	16.23	45.2	5 35	55.7
19.9	39.04 22	70.6 37	3.01 15	11.3 10	16.57 34	41.4 38	5.50 15	52.6 31
29.9	39.35 31	67.1 35	3.19 18	12.5 12	17.07 50	37.8 36	5.71 21	49.4 32
May 9.9	39.73 38	63.7 34	3.41 22	14.0 15	17.70 63	34.4 34	5.96 25	46.4 30
19.9	40.18 45	60.6 31	3.67 26	15.6 16	18.46 76	31.4 30	6.25 29	43.4 30
	51	28	28	18	88	27	33	28
29.8	40.69	57.8	3.95	17.4	19.34	28.7	6.58	40.6
June 8.8	41.24 55	55.4 24	4.25 30	19.4 20	20.31 97	26.4 23	6.94 36	38.1 25
18.8	41.83 59	53.5 19	4.57 32	21.5 21	21.34 103	24.7 17	7.32 38	35.9 22
28.7	42.44 61	52.0 15	4.89 32	23.6 21	22.41 107	23.5 12	7.71 39	34.0 19
July 8.7	43.05 61	51.1 9	5.21 32	25.6 20	23.50 109	22.8 7	8.10 39	32.6 14
	59	3	31	20	107	1	38	10
18.7	43.64	50.8	5.52	27.6	24.57	22.7	8.48	31.6
28.7	44.21 57	51.0 2	5.81 29	29.5 19	25.59 102	23.2 5	8.84 36	31.1 5
Aug. 7.6	44.73 52	51.7 7	6.08 27	31.2 17	26.54 95	24.3 11	9.18 34	31.0 1
17.6	45.19 46	53.0 13	6.31 23	32.7 15	27.38 84	25.9 16	9.48 30	31.4 4
27.6	45.57 38	54.7 17	6.52 21	34.0 13	28.08 70	27.9 20	9.73 25	32.3 9
	30	21	16	11	55	25	21	13
Sept. 6.6	45.87	56.8	6.68	35.1	28.63	30.4	9.94	33.6
16.5	46.08 21	59.3 25	6.81 13	35.9 8	29.01 38	33.1 27	10.09 15	35.2 16
26.5	46.20 12	62.0 27	6.91 10	36.4 5	29.20 19	36.0 29	10.19 10	37.1 19
Oct. 6.5	46.22 2	64.8 28	6.96 5	36.7 3	29.20 0	39.1 31	10.23 4	39.2 21
16.4	46.15 7	67.6 28	6.99 3	36.8 1	29.02 18	42.1 30	10.23 0	41.4 22
	16	27	1	1	37	28	5	23
26.4	45.99	70.3	6.98	36.7	28.65	44.9	10.18	43.7
Nov. 5.4	45.75 24	72.8 25	6.95 3	36.5 2	28.13 52	47.5 26	10.09 9	45.8 21
15.4	45.45 30	74.9 21	6.90 5	36.1 4	27.46 67	49.7 22	9.97 12	47.8 20
25.3	45.09 36	76.7 18	6.83 7	35.6 5	26.67 79	51.4 17	9.82 15	49.5 17
Dec. 5.3	44.70 39	77.9 12	6.75 8	35.0 6	25.80 87	52.6 12	9.65 17	51.0 15
	41	7	9	7	92	6	18	10
15.3	44.29	78.6	6.66	34.3	24.88	53.2	9.47	52.0
25.3	43.87 42	78.7 1	6.56 10	33.7 6	23.94 94	53.1 1	9.28 19	52.6 6
35.2	43.46 41	78.2 5	6.45 11	33.0 7	23.01 93	52.4 7	9.09 19	52.8 2
Dec 8, Tan 8	2.400	—2.181	1.000	+0.026	4.706	—4.598	1.362	—0.925
Mean Place	39°.189	86''.29	2°.687	8''.31	18°.226	58''.65	5°.172	63''.30
Δα, Δα	0.00	+0.15	0.00	0.00	—0.01	+0.31	0.00	+0.06
Δδ, Δδ	+0.4	+0.1	+0.4	+0.1	+0.4	+0.1	+0.4	+0.1





FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ε Andromedæ. Mag. 4.5		δ Andromedæ. Mag. 3.5		α Cassiopeiæ. (Schedir.) Var. 2.2-2.8		μ Phœnicis. Mag. 4.6	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 0 34 s	° ' " +28 51 "	h m 0 34 s	° ' " +30 23 "	h m 0 35 s	° ' " +56 4 "	h m 0 37 s	° ' " -46 32 "
Jan. 0.2	3.92	14.7	47.03	59.0	40.40	37.7	19.65	77.7
10.2	3.79 13	14.0 7	46.90 13	58.3 7	40.12 28	37.4 3	19.44 21	77.6 1
20.2	3.66 13	13.1 9	46.76 14	57.4 9	39.85 27	36.6 8	19.23 21	77.0 6
30.2	3.53 13	12.0 11	46.63 13	56.3 11	39.59 26	35.2 14	19.05 18	76.0 10
Feb. 9.1	3.42 11 10	10.7 13 15	46.51 12 9	54.9 14 15	39.36 23 20	33.5 17 21	18.88 17 14	74.5 15 19
19.1	3.32	9.2	46.42	53.4	39.16	31.4	18.74	72.6
Mar 1.1	3.25 7	7.7 15	46.35 7	51.9 15	39.01 15	29.1 23	18.63 11	70.4 22
11.1	3.22 3	6.3 14	46.31 4	50.3 16	38.92 9	26.7 24	18.56 7	67.8 26
21.0	3.23 1	4.9 14	46.32 1	48.9 14	38.89 3	24.2 25	18.54 2	65.0 28
31.0	3.28 5 10	3.7 12 9	46.37 5 10	47.7 12 11	38.94 5 13	21.7 25 22	18.57 3 8	62.0 30 32
Apr. 10.0	3.38	2.8	46.47	46.6	39.07	19.5	18.65	58.8
19.9	3.53 15	2.1 7	46.62 15	45.9 7	39.27 20	17.5 20	18.78 13	55.5 33
29.9	3.72 19	1.8 3	46.82 20	45.5 4	39.54 27	15.8 17	18.97 19	52.2 33
May 9.9	3.96 24	1.8 0	47.06 24	45.4 1	39.87 33	14.6 12	19.21 24	49.0 32
19.9	4.24 28 31	2.2 4 8	47.34 28 31	45.8 4 7	40.26 39 44	13.8 8 3	19.49 28 33	45.9 31 29
29.8	4.55	3.0	47.65	46.5	40.70	13.5	19.82	43.0
June 8.8	4.88 33	4.2 12	47.99 34	47.6 11	41.17 47	13.7 2	20.18 36	40.3 27
18.8	5.23 35	5.6 14	48.35 36	49.0 14	41.66 49	14.4 7	20.57 39	38.0 23
28.8	5.59 36	7.3 17	48.71 36	50.7 17	42.16 50	15.6 12	20.97 40	36.0 20
July 8.7	5.94 35 34	9.3 20 22	49.07 36 34	52.6 19 22	42.66 50 48	17.2 16 20	21.38 41 40	34.5 15 10
18.7	6.28	11.5	49.41	54.8	43.14	19.2	21.78	33.5
28.7	6.61 33	13.8 23	49.74 33	57.2 24	43.59 45	21.6 24	22.17 39	32.9 6
Aug. 7.6	6.90 29	16.2 24	50.04 30	59.6 24	44.00 41	24.3 27	22.53 36	32.9 0
17.6	7.17 27	18.7 25	50.31 27	62.1 25	44.38 38	27.2 29	22.85 32	33.3 4
27.6	7.40 23 20	21.1 24 23	50.55 24 20	64.6 25 24	44.70 32 26	30.3 31 33	23.13 28 23	34.2 9 14
Sept. 6.6	7.60	23.4	50.75	67.0	44.96	33.6	23.36	35.6
16.5	7.75 15	25.7 23	50.90 15	69.3 23	45.17 21	36.9 33	23.54 18	37.3 17
26.5	7.86 11	27.8 21	51.02 12	71.5 22	45.33 16	40.1 32	23.66 12	39.4 21
Oct. 6.5	7.94 8	29.7 19	51.10 8	73.5 20	45.42 9	43.3 32	23.72 6	41.6 22
16.5	7.98 4 1	31.4 17 15	51.14 4 1	75.3 18 15	45.46 4 2	46.4 31 29	23.73 1 4	44.0 24 24
26.4	7.99	32.9	51.15	76.8	45.44	49.3	23.69	46.4
Nov. 5.4	7.97 2	34.1 12	51.13 2	78.2 14	45.38 6	51.8 25	23.61 8	48.8 24
15.4	7.92 5	35.1 10	51.08 5	79.2 10	45.26 12	54.1 23	23.48 13	51.0 22
25.3	7.85 7	35.8 7	51.00 8	80.0 8	45.10 16	56.0 19	23.32 16	52.9 19
Dec. 5.3	7.75 10 11	36.1 3 1	50.91 9 11	80.4 4 2	44.91 19 22	57.4 14 10	23.14 18 20	54.5 16 11
15.3	7.64	36.2	50.80	80.6	44.69	58.4	22.94	55.6
25.3	7.52 12	36.0 2	50.67 13	80.4 2	44.44 25	58.9 5	22.73 21	56.3 7
35.2	7.39 13	35.5 5	50.54 13	79.9 5	44.17 27	58.9 0	22.52 21	56.6 3
Sec δ, Tan δ	1.142	+0.551	1.159	+0.587	1.792	+1.487	1.454	-1.056
Mean Place	3°.624	1''.40	46°.744	45''.13	40°.497	16''.87	18°.605	66''.68
Δα, Δα	0.00	-0.04	0.00	-0.04	+0.01	-0.10	0.00	+0.07
Δδ, Δδ	+0.4	+0.1	+0.4	+0.2	+0.4	+0.2	+0.4	+0.2

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Ceti. Mag. 2.2		$\theta$ Cassiopeiae. Mag. 4.7		$\delta 1$ Cassiopeiae. Mag. 5.6		$\zeta$ Andromedae. Mag. 4.3	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 0 39 s	° ' " - 18 26 "	h m 0 39 s	° ' " + 47 49 "	h m 0 39 s	° ' " + 74 31 "	h m 0 42 s	° ' " + 23 48 "
Jan. 0.3	20.14	73.4	59.07	28.8	59.78	49.4	50.21	29.8
10.2	20.03 <sup>11</sup>	73.8 4	58.86 <sup>21</sup>	28.5 3	59.08 <sup>70</sup>	49.5 1	50.09 <sup>12</sup>	29.2 6
20.2	19.91 <sup>12</sup>	74.0 2	58.65 <sup>21</sup>	27.6 9	58.39 <sup>69</sup>	48.9 6	49.96 <sup>13</sup>	28.4 8
30.2	19.80 <sup>11</sup>	73.9 1	58.45 <sup>20</sup>	26.3 13	57.73 <sup>66</sup>	47.7 12	49.84 <sup>12</sup>	27.3 11
Feb. 9.1	19.70 <sup>10</sup>	73.6 3	58.27 <sup>18</sup>	24.7 16	57.12 <sup>61</sup>	46.1 16	49.73 <sup>11</sup>	26.2 11
	8	6	16	19	52	22	9	12
19.1	19.62	73.0	58.11	22.8	56.60	43.9	49.64	25.0
Mar. 1.1	19.57 5	72.1 9	57.99 <sup>12</sup>	20.7 21	56.20 <sup>40</sup>	41.4 25	49.57 7	23.7 13
11.1	19.53 4	71.0 11	57.92 7	18.5 22	55.92 <sup>28</sup>	38.7 27	49.53 4	22.5 12
21.0	19.54 1	69.6 14	57.91 1	16.3 22	55.78 <sup>14</sup>	35.7 30	49.53 0	21.5 10
31.0	19.58 4	68.0 16	57.95 4	14.2 21	55.80 2	32.8 29	49.58 5	20.6 9
	8	10	11	19	18	28	9	7
Apr. 10.0	19.66	66.1	58.06	12.3	55.98	30.0	49.67	19.9
20.0	19.78 <sup>12</sup>	64.1 20	58.23 <sup>17</sup>	10.6 17	56.31 <sup>33</sup>	27.3 27	49.80 <sup>13</sup>	19.5 4
29.9	19.95 <sup>17</sup>	61.9 22	58.46 <sup>23</sup>	9.3 13	56.78 <sup>47</sup>	25.0 23	49.98 <sup>18</sup>	19.4 1
May 9.9	20.15 <sup>20</sup>	59.5 24	58.75 <sup>29</sup>	8.4 9	57.38 <sup>60</sup>	23.1 19	50.21 <sup>23</sup>	19.7 3
19.9	20.39 <sup>24</sup>	57.1 24	59.08 <sup>33</sup>	7.9 5	58.10 <sup>72</sup>	21.6 15	50.47 <sup>26</sup>	20.3 6
	28	24	38	0	80	10	29	9
29.8	20.67	54.7	59.46	7.9	58.90	20.6	50.76	21.2
June 8.8	20.97 <sup>30</sup>	52.3 24	59.87 <sup>41</sup>	8.4 5	59.77 <sup>87</sup>	20.2 4	51.08 <sup>32</sup>	22.5 13
18.8	21.29 <sup>32</sup>	50.0 23	60.29 <sup>42</sup>	9.2 8	60.68 <sup>91</sup>	20.3 1	51.42 <sup>34</sup>	24.0 15
28.8	21.62 <sup>33</sup>	47.9 21	60.73 <sup>44</sup>	10.5 13	61.60 <sup>92</sup>	21.0 7	51.76 <sup>34</sup>	25.8 18
July 8.7	21.95 <sup>33</sup>	45.9 20	61.16 <sup>43</sup>	12.2 17	62.52 <sup>92</sup>	22.2 12	52.10 <sup>34</sup>	27.7 19
	32	16	42	21	90	17	34	22
18.7	22.27	44.3	61.58	14.3	63.42	23.9	52.44	29.9
28.7	22.58 <sup>31</sup>	42.9 14	61.97 <sup>39</sup>	16.7 24	64.26 <sup>84</sup>	26.1 22	52.76 <sup>32</sup>	32.1 22
Aug. 7.6	22.87 <sup>29</sup>	41.8 11	62.34 <sup>37</sup>	19.3 26	65.03 <sup>77</sup>	28.7 26	53.05 <sup>29</sup>	34.3 22
17.6	23.12 <sup>25</sup>	41.1 7	62.67 <sup>33</sup>	22.1 28	65.72 <sup>69</sup>	31.6 29	53.32 <sup>27</sup>	36.6 23
27.6	23.35 <sup>23</sup>	40.7 4	62.95 <sup>28</sup>	25.0 29	66.33 <sup>61</sup>	34.8 32	53.55 <sup>23</sup>	38.8 22
	19	0	24	30	50	35	20	21
Sept. 6.6	23.54	40.7	63.19	28.0	66.83	38.3	53.75	40.9
16.5	23.69 <sup>15</sup>	41.1 4	63.38 <sup>19</sup>	31.0 30	67.21 <sup>38</sup>	41.9 36	53.91 <sup>16</sup>	42.9 20
26.5	23.80 <sup>11</sup>	41.7 6	63.53 <sup>15</sup>	34.0 30	67.48 <sup>27</sup>	45.6 37	54.03 <sup>12</sup>	44.7 18
Oct. 6.5	23.88 8	42.6 9	63.62 9	36.9 29	67.63 <sup>15</sup>	49.3 37	54.12 9	46.3 16
16.5	23.91 3	43.7 11	63.67 5	39.6 27	67.66 3	53.0 37	54.17 5	47.8 15
	0	12	1	25	9	35	2	12
26.4	23.91	44.9	63.68	42.1	67.57	56.5	54.19	49.0
Nov. 5.4	23.89 2	46.2 13	63.64 4	44.3 22	67.37 <sup>20</sup>	59.8 33	54.18 1	49.9 9
15.4	23.83 6	47.5 13	63.56 8	46.2 19	67.06 <sup>31</sup>	62.7 29	54.14 4	50.6 7
25.4	23.76 7	48.8 13	63.45 <sup>11</sup>	47.8 16	66.64 <sup>42</sup>	65.3 26	54.08 6	51.1 5
Dec. 5.3	23.67 9	50.0 12	63.31 <sup>14</sup>	49.0 12	66.14 <sup>50</sup>	67.5 22	54.00 8	51.4 3
	11	10	17	7	59	16	10	1
15.3	23.56	51.0	63.14	49.7	65.55	69.1	53.90	51.3
25.3	23.45 <sup>11</sup>	51.8 8	62.96 <sup>18</sup>	50.0 3	64.91 <sup>64</sup>	70.1 10	53.79 <sup>11</sup>	51.1 2
35.2	23.33 <sup>12</sup>	52.4 6	62.75 <sup>21</sup>	49.8 2	64.23 <sup>68</sup>	70.6 5	53.67 <sup>12</sup>	50.6 5
Sec $\delta$ , Tan $\delta$	1.054	-0.334	1.490	+1.104	3.749	+3.613	1.093	+0.441
Mean Place	19 <sup>a</sup> .419	70 <sup>''</sup> .44	58 <sup>a</sup> .953	9 <sup>''</sup> .82	60 <sup>a</sup> .695	25 <sup>''</sup> .22	49 <sup>a</sup> .797	17 <sup>''</sup> .90
D <sup>'</sup> $\psi$ $\alpha$ , D <sub><math>\omega</math></sub> $\alpha$	0.00	+0.02	+0.01	-0.07	+0.02	-0.24	0.00	-0.03
D $\psi$ $\delta$ , D <sub><math>\omega</math></sub> $\delta$	+0.4	+0.2	+0.4	+0.2	+0.4	+0.2	+0.4	+0.2

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\eta$ Cassiopeiæ. Mag. 3.6		$\delta$ Piscium. Mag. 4.6		$\lambda$ Hydri. Mag. 5.0		20 Ceti. Mag. 4.9	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 0 43 s O 43 + 57 21 " "	° ' "	h m 0 44 s O 44 + 7 7 " "	° ' "	h m 0 45 s O 45 - 75 22 " "	° ' "	h m 0 48 s O 48 - 1 35 " "	° ' "
Jan. 0.3	56.94	78.5	16.81	27.9	41.52	84.0	40.39	76.5
10.2	56.66 <sup>28</sup>	78.3 <sup>2</sup>	16.70 <sup>11</sup>	27.2 <sup>7</sup>	40.73 <sup>79</sup>	83.3 <sup>7</sup>	40.29 <sup>10</sup>	77.1 <sup>6</sup>
20.2	56.37 <sup>29</sup>	77.6 <sup>7</sup>	16.59 <sup>11</sup>	26.5 <sup>7</sup>	39.97 <sup>76</sup>	82.0 <sup>13</sup>	40.18 <sup>11</sup>	77.7 <sup>6</sup>
30.2	56.10 <sup>27</sup>	76.3 <sup>13</sup>	16.49 <sup>10</sup>	25.8 <sup>7</sup>	39.26 <sup>71</sup>	80.2 <sup>18</sup>	40.08 <sup>10</sup>	78.1 <sup>4</sup>
Feb. 9.1	55.85 <sup>25</sup> 21	74.7 <sup>16</sup> 20	16.40 <sup>9</sup> 8	25.2 <sup>6</sup> 5	38.62 <sup>64</sup> 55	77.9 <sup>23</sup> 28	39.98 <sup>10</sup> 8	78.5 <sup>4</sup> 2
19.1	55.64	72.7	16.32	24.7	38.07	75.1	39.90	78.7
Mar 1.1	55.47 <sup>17</sup>	70.4 <sup>23</sup>	16.26 <sup>6</sup>	24.2 <sup>5</sup>	37.62 <sup>45</sup>	71.9 <sup>32</sup>	39.84 <sup>6</sup>	78.7 <sup>0</sup>
11.1	55.36 <sup>11</sup>	67.9 <sup>25</sup>	16.23 <sup>3</sup>	23.9 <sup>3</sup>	37.29 <sup>33</sup>	68.5 <sup>34</sup>	39.81 <sup>3</sup>	78.5 <sup>2</sup>
21.0	55.33 <sup>3</sup>	65.3 <sup>26</sup>	16.23 <sup>0</sup>	23.8 <sup>1</sup>	37.07 <sup>22</sup>	64.8 <sup>37</sup>	39.80 <sup>1</sup>	78.1 <sup>4</sup>
31.0	55.36 <sup>3</sup> 12	62.8 <sup>25</sup> 23	16.27 <sup>4</sup> 8	23.9 <sup>1</sup> 3	36.98 <sup>9</sup> 5	61.0 <sup>38</sup> 39	39.84 <sup>4</sup> 7	77.5 <sup>6</sup> 9
Apr. 10.0	55.48	60.5	16.35	24.2	37.03	57.1	39.91	76.6
20.0	55.67 <sup>19</sup>	58.4 <sup>21</sup>	16.48 <sup>13</sup>	24.8 <sup>6</sup>	37.22 <sup>19</sup>	53.3 <sup>38</sup>	40.03 <sup>12</sup>	75.5 <sup>11</sup>
29.9	55.94 <sup>27</sup>	56.6 <sup>18</sup>	16.64 <sup>16</sup>	25.6 <sup>8</sup>	37.53 <sup>31</sup>	49.5 <sup>38</sup>	40.19 <sup>16</sup>	74.2 <sup>13</sup>
May 9.9	56.28 <sup>34</sup>	55.3 <sup>13</sup>	16.85 <sup>21</sup>	26.8 <sup>12</sup>	37.97 <sup>44</sup>	46.0 <sup>35</sup>	40.39 <sup>20</sup>	72.6 <sup>16</sup>
19.9	56.68 <sup>40</sup> 44	54.4 <sup>9</sup> 5	17.09 <sup>24</sup> 27	28.2 <sup>14</sup> 15	38.53 <sup>56</sup> 67	42.7 <sup>33</sup> 29	40.62 <sup>23</sup> 26	70.9 <sup>17</sup> 19
29.8	57.12	53.9	17.36	29.7	39.20	39.8	40.88	69.0
June 8.8	57.61 <sup>49</sup>	54.0 <sup>1</sup>	17.66 <sup>30</sup>	31.5 <sup>18</sup>	39.96 <sup>76</sup>	37.2 <sup>26</sup>	41.17 <sup>29</sup>	67.0 <sup>20</sup>
18.8	58.12 <sup>51</sup>	54.5 <sup>5</sup>	17.98 <sup>32</sup>	33.4 <sup>19</sup>	40.79 <sup>83</sup>	35.2 <sup>20</sup>	41.48 <sup>31</sup>	64.9 <sup>21</sup>
28.8	58.64 <sup>52</sup>	55.6 <sup>11</sup>	18.30 <sup>32</sup>	35.4 <sup>20</sup>	41.67 <sup>88</sup>	33.6 <sup>16</sup>	41.80 <sup>32</sup>	62.8 <sup>21</sup>
July 8.7	59.15 <sup>51</sup> 50	57.1 <sup>15</sup> 19	18.62 <sup>32</sup> 32	37.4 <sup>20</sup> 21	42.57 <sup>90</sup> 91	32.6 <sup>10</sup> 4	42.12 <sup>32</sup> 32	60.7 <sup>21</sup> 19
18.7	59.65	59.0	18.94	39.5	43.48	32.2	42.44	58.8
28.7	60.13 <sup>48</sup>	61.2 <sup>22</sup>	19.24 <sup>30</sup>	41.5 <sup>20</sup>	44.36 <sup>88</sup>	32.3 <sup>1</sup>	42.74 <sup>30</sup>	57.0 <sup>18</sup>
Aug. 7.7	60.57 <sup>44</sup>	63.8 <sup>26</sup>	19.52 <sup>28</sup>	43.3 <sup>18</sup>	45.19 <sup>83</sup>	33.0 <sup>7</sup>	43.02 <sup>28</sup>	55.4 <sup>16</sup>
17.6	60.97 <sup>40</sup>	66.7 <sup>29</sup>	19.78 <sup>26</sup>	45.0 <sup>17</sup>	45.95 <sup>76</sup>	34.3 <sup>13</sup>	43.28 <sup>26</sup>	54.0 <sup>14</sup>
27.6	61.31 <sup>34</sup> 30	69.8 <sup>31</sup> 31	20.00 <sup>22</sup> 19	46.6 <sup>16</sup> 13	46.60 <sup>65</sup> 53	36.1 <sup>18</sup> 23	43.50 <sup>22</sup> 19	52.8 <sup>12</sup> 9
Sept. 6.6	61.61	72.9	20.19	47.9	47.13	38.4	43.69	51.9
16.5	61.84 <sup>23</sup>	76.2 <sup>33</sup>	20.34 <sup>15</sup>	49.0 <sup>11</sup>	47.52 <sup>39</sup>	41.0 <sup>26</sup>	43.85 <sup>16</sup>	51.3 <sup>6</sup>
26.5	62.02 <sup>18</sup>	79.5 <sup>33</sup>	20.46 <sup>12</sup>	49.9 <sup>9</sup>	47.76 <sup>24</sup>	43.8 <sup>28</sup>	43.97 <sup>12</sup>	50.9 <sup>4</sup>
Oct. 6.5	62.13 <sup>11</sup>	82.7 <sup>32</sup>	20.54 <sup>8</sup>	50.5 <sup>6</sup>	47.85 <sup>9</sup>	46.8 <sup>30</sup>	44.05 <sup>8</sup>	50.8 <sup>1</sup>
16.5	62.19 <sup>6</sup> 0	85.8 <sup>31</sup> 29	20.59 <sup>5</sup> 2	50.9 <sup>4</sup> 2	47.77 <sup>8</sup> 23	49.9 <sup>31</sup> 30	44.10 <sup>5</sup> 2	51.0 <sup>2</sup> 3
26.4	62.19	88.7	20.61	51.1	47.54	52.9	44.12	51.3
Nov. 5.4	62.14 <sup>5</sup>	91.4 <sup>27</sup>	20.60 <sup>1</sup>	51.2 <sup>1</sup>	47.17 <sup>37</sup>	55.7 <sup>28</sup>	44.12 <sup>0</sup>	51.7 <sup>4</sup>
15.4	62.04 <sup>10</sup>	93.7 <sup>23</sup>	20.57 <sup>3</sup>	51.0 <sup>2</sup>	46.67 <sup>50</sup>	58.2 <sup>25</sup>	44.09 <sup>3</sup>	52.3 <sup>6</sup>
25.4	61.89 <sup>15</sup>	95.7 <sup>20</sup>	20.52 <sup>5</sup>	50.7 <sup>3</sup>	46.06 <sup>61</sup>	60.2 <sup>20</sup>	44.04 <sup>5</sup>	53.0 <sup>7</sup>
Dec. 5.3	61.70 <sup>19</sup> 22	97.3 <sup>16</sup> 11	20.45 <sup>7</sup> 9	50.3 <sup>4</sup> 5	45.36 <sup>70</sup> 76	61.7 <sup>15</sup> 10	43.97 <sup>7</sup> 9	53.7 <sup>7</sup> 7
15.3	61.48	98.4	20.36	49.8	44.60	62.7	43.88	54.4
25.3	61.23 <sup>25</sup>	99.0 <sup>6</sup>	20.26 <sup>10</sup>	49.2 <sup>6</sup>	43.81 <sup>79</sup>	63.1 <sup>4</sup>	43.79 <sup>9</sup>	55.2 <sup>8</sup>
35.2	60.95 <sup>28</sup>	99.0 <sup>0</sup>	20.16 <sup>10</sup>	48.6 <sup>6</sup>	43.01 <sup>80</sup>	62.8 <sup>3</sup>	43.68 <sup>11</sup>	55.8 <sup>6</sup>
Sec. & Tan $\delta$	1.855	+1.562	1.008	+0.125	3.963	-3.834	1.000	-0.028
Mean Place	56°.963	57''.15	16°.251	21''.73	39°.057	68''.87	39°.747	79''.65
$D_{\delta}$ , $D_{\alpha}$	+0.01	-0.10	0.00	-0.01	-0.02	+0.26	0.00	0.00
$\delta$ , $D_{\delta}$	+0.4	+0.2	+0.4	+0.2	+0.4	+0.2	+0.4	+0.2

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\gamma$ Cassiopeæ. Mag. 2.2		$\mu$ Andromedæ. Mag. 3.9		$\alpha$ Sculptoris. Mag. 4.4		$\epsilon$ Pisc Mag.
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.
	h m 0 51 s	° ' +60 15 "	h m 0 52 s	° ' +38 2 "	h m 0 54 s	° ' -29 48 "	h m 0 58 s
Jan. 0.3	34.04	46.3	2.17	35.3	31.52	66.7	32.45
10.2	33.73 31	46.3 0	2.01 16	34.9 4	31.37 15	67.1 4	32.34 11
20.2	33.40 33	45.6 7	1.85 16	34.1 8	31.23 14	67.1 0	32.23 11
30.2	33.09 31	44.5 11	1.69 16	33.0 11	31.09 14	66.8 3	32.12 11
Feb. 9.2	32.80 29 25	42.9 16 20	1.54 15 13	31.6 14 16	30.96 13 11	66.1 7 11	32.02 10 9
19.1	32.55	40.9	1.41	30.0	30.85	65.0	31.93
Mar. 1.1	32.35 20	38.7 22	1.31 10	28.3 17	30.76 9	63.6 14	31.86 7
11.1	32.21 14	36.2 25	1.25 6	26.5 18	30.70 6	61.9 17	31.82 4
21.0	32.14 7	33.6 26	1.23 2	24.7 18	30.68 2	59.9 20	31.81 1
31.0	32.16 2 11	31.1 25 25	1.26 3 9	23.1 16 15	30.70 2 6	57.7 22 25	31.83 2 7
Apr. 10.0	32.27	28.6	1.35	21.6	30.76	55.2	31.90
20.0	32.46 19	26.4 22	1.49 14	20.4 12	30.86 10	52.6 26	32.01 11
29.9	32.73 27	24.5 19	1.68 19	19.6 8	31.01 15	49.9 27	32.16 15
May 9.9	33.07 34	23.0 15	1.92 24	19.0 6	31.21 20	47.1 28	32.36 20
19.9	33.48 41 47	21.9 11 7	2.21 29 33	18.9 1 3	31.44 23 28	44.3 28 27	32.59 23 26
29.9	33.95	21.2	2.54	19.2	31.72	41.6	32.85
June 8.8	34.46 51	21.1 1	2.89 35	19.9 7	32.02 30	39.0 26	33.14 29
18.8	34.99 53	21.5 4	3.26 37	20.9 10	32.35 33	36.5 25	33.45 31
28.8	35.54 55	22.4 9	3.65 39	22.3 14	32.69 34	34.3 22	33.77 32
July 8.7	36.09 55 54	23.7 13 18	4.04 39 37	24.1 18 20	33.04 35 34	32.4 19 16	34.10 33 32
18.7	36.63	25.5	4.41	26.1	33.38	30.8	34.42
28.7	37.14 51 48	27.7 22 26	4.77 36 34	28.4 23 24	33.71 33 31	29.7 11 8	34.72 30 29
Aug. 7.7	37.62 48	30.3 26	5.11 34	30.8 24	34.02 31	28.9 3	35.01 26
17.6	38.05 43	33.1 28	5.41 30	33.3 25	34.31 29	28.6 1	35.27 24
27.6	38.43 38 32	36.1 30 32	5.68 27 23	35.9 26 27	34.56 25 21	28.7 1 5	35.51 24 20
Sept. 6.6	38.75	39.3	5.91	38.6	34.77	29.2	35.71
16.6	39.01 26	42.6 33	6.10 19	41.2 26	34.94 17	30.1 9	35.88 17
26.5	39.21 20	46.0 34	6.24 14	43.7 25	35.07 13	31.4 13	36.01 13
Oct. 6.5	39.35 14	49.3 33	6.35 11	46.1 24	35.16 9	32.9 15	36.10 9
16.5	39.42 7 1	52.5 32 31	6.42 7 3	48.3 22 20	35.21 5 0	34.6 17 18	36.17 7 3
26.4	39.43	55.6	6.45	50.3	35.21	36.4	36.20
Nov. 5.4	39.38 5	58.4 28	6.44 1	52.1 18	35.18 3	38.3 19	36.21 1
15.4	39.27 11	60.9 25	6.40 4	53.6 15	35.13 5	40.1 18	36.19 2
25.4	39.11 16	63.1 22	6.33 7	54.8 12	35.04 9	41.8 17	36.14 5
Dec. 5.3	38.90 21 25	64.9 18 12	6.23 10 12	55.6 8 5	34.93 11 12	43.3 15 13	36.08 6 8
15.3	38.65	66.1	6.11	56.1	34.81	44.6	36.00
25.3	38.37 28	66.9 8	5.97 14	56.3 2	34.67 14	45.6 10	35.91 9
35.3	38.06 31	67.2 3	5.82 15	56.0 3	34.53 14	46.2 6	35.81 10
Sec $\delta$ , Tan $\delta$	2.016	+1.750	1.270	+0.782	1.153	-0.573	1.008
Mean Place	34°.034	24''.17	1°.817	18''.68	30°.589	60''.63	31°.808
$D'\psi a$ , $D_{\omega} a$	+0.01	-0.11	0.00	-0.05	0.00	+0.04	0.00
$D'\psi \delta$ , $D_{\omega} \delta$	+0.4	+0.2	+0.4	+0.2	+0.4	+0.2	+0.4

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Phœnicis. Mag. 3.4		$\mu$ Cassiopeiæ. Mag. 5.3		$\eta$ Ceti. Mag. 3.6		$\beta$ Andromedæ. Mag. 2.4	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 1 2	° ' -47 9	h m 1 2	° ' +54 30	h m 1 4	° ' -10 37	h m 1 4	° ' +35 10
	s	"	s	"	s	"	s	"
Jan. 0.3	18.68	97.0	36.53	35.4	19.63	56.5	58.55	28.7
10.2	18.45 <sup>23</sup>	97.2 <sup>2</sup>	36.29 <sup>24</sup>	35.3 <sup>1</sup>	19.52 <sup>11</sup>	57.1 <sup>6</sup>	58.40 <sup>15</sup>	28.3 <sup>4</sup>
20.2	18.23 <sup>22</sup>	96.8 <sup>4</sup>	36.04 <sup>25</sup>	34.7 <sup>6</sup>	19.41 <sup>11</sup>	57.6 <sup>5</sup>	58.24 <sup>16</sup>	27.6 <sup>7</sup>
30.2	18.02 <sup>21</sup>	96.0 <sup>8</sup>	35.79 <sup>25</sup>	33.6 <sup>11</sup>	19.29 <sup>12</sup>	57.8 <sup>2</sup>	58.09 <sup>15</sup>	26.6 <sup>10</sup>
Feb. 9.2	17.82 <sup>20</sup>	94.8 <sup>12</sup>	35.56 <sup>23</sup>	32.1 <sup>15</sup>	19.19 <sup>10</sup>	57.9 <sup>1</sup>	57.94 <sup>15</sup>	25.4 <sup>12</sup>
	17	17	20	18	10	2	13	15
19.1	17.65	93.1	35.36	30.3	19.09	57.7	57.81	23.9
Mar. 1.1	17.51 <sup>14</sup>	90.9 <sup>22</sup>	35.19 <sup>17</sup>	28.2 <sup>21</sup>	19.02 <sup>7</sup>	57.3 <sup>4</sup>	57.71 <sup>10</sup>	22.3 <sup>16</sup>
11.1	17.40 <sup>11</sup>	88.5 <sup>24</sup>	35.08 <sup>11</sup>	25.8 <sup>24</sup>	18.97 <sup>5</sup>	56.6 <sup>7</sup>	57.64 <sup>7</sup>	20.7 <sup>16</sup>
21.0	17.34 <sup>6</sup>	85.7 <sup>28</sup>	35.03 <sup>5</sup>	23.4 <sup>24</sup>	18.95 <sup>2</sup>	55.7 <sup>9</sup>	57.61 <sup>3</sup>	19.1 <sup>16</sup>
31.0	17.33 <sup>1</sup>	82.7 <sup>30</sup>	35.05 <sup>2</sup>	21.0 <sup>24</sup>	18.96 <sup>1</sup>	54.6 <sup>11</sup>	57.63 <sup>2</sup>	17.6 <sup>15</sup>
	4	32	9	22	6	14	7	13
Apr. 10.0	17.37	79.5	35.14	18.8	19.02	53.2	57.70	16.3
20.0	17.46 <sup>9</sup>	76.2 <sup>33</sup>	35.30 <sup>16</sup>	16.7 <sup>21</sup>	19.12 <sup>10</sup>	51.6 <sup>16</sup>	57.82 <sup>12</sup>	15.2 <sup>11</sup>
29.9	17.61 <sup>15</sup>	72.8 <sup>34</sup>	35.54 <sup>24</sup>	14.9 <sup>18</sup>	19.26 <sup>14</sup>	49.8 <sup>18</sup>	57.99 <sup>17</sup>	14.4 <sup>8</sup>
May 9.9	17.81 <sup>20</sup>	69.5 <sup>33</sup>	35.84 <sup>30</sup>	13.5 <sup>14</sup>	19.44 <sup>18</sup>	47.8 <sup>20</sup>	58.22 <sup>23</sup>	14.0 <sup>4</sup>
19.9	18.07 <sup>26</sup>	66.3 <sup>32</sup>	36.20 <sup>36</sup>	12.5 <sup>10</sup>	19.66 <sup>22</sup>	45.7 <sup>21</sup>	58.49 <sup>27</sup>	13.9 <sup>1</sup>
	30	31	41	5	25	23	30	3
29.9	18.37	63.2	36.61	12.0	19.91	43.4	58.79	14.2
June 8.8	18.71 <sup>34</sup>	60.3 <sup>29</sup>	37.07 <sup>46</sup>	11.9 <sup>1</sup>	20.20 <sup>29</sup>	41.2 <sup>22</sup>	59.13 <sup>34</sup>	14.9 <sup>7</sup>
18.8	19.09 <sup>38</sup>	57.8 <sup>25</sup>	37.55 <sup>48</sup>	12.3 <sup>4</sup>	20.50 <sup>30</sup>	39.0 <sup>22</sup>	59.49 <sup>36</sup>	15.9 <sup>10</sup>
28.8	19.48 <sup>39</sup>	55.7 <sup>21</sup>	38.04 <sup>49</sup>	13.2 <sup>9</sup>	20.82 <sup>32</sup>	36.8 <sup>22</sup>	59.86 <sup>37</sup>	17.3 <sup>14</sup>
July 8.7	19.89 <sup>41</sup>	53.9 <sup>18</sup>	38.54 <sup>50</sup>	14.4 <sup>12</sup>	21.14 <sup>32</sup>	34.7 <sup>21</sup>	60.24 <sup>38</sup>	18.9 <sup>16</sup>
	40	12	49	17	32	18	37	20
18.7	20.29	52.7	39.03	16.1	21.46	32.9	60.61	20.9
28.7	20.69 <sup>40</sup>	51.9 <sup>8</sup>	39.50 <sup>47</sup>	18.2 <sup>21</sup>	21.77 <sup>31</sup>	31.2 <sup>17</sup>	60.97 <sup>36</sup>	23.0 <sup>21</sup>
Aug. 7.7	21.06 <sup>37</sup>	51.6 <sup>3</sup>	39.94 <sup>44</sup>	20.6 <sup>24</sup>	22.06 <sup>29</sup>	29.9 <sup>13</sup>	61.30 <sup>33</sup>	25.3 <sup>23</sup>
17.6	21.41 <sup>35</sup>	51.9 <sup>3</sup>	40.35 <sup>41</sup>	23.2 <sup>26</sup>	22.33 <sup>27</sup>	28.8 <sup>11</sup>	61.61 <sup>31</sup>	27.7 <sup>24</sup>
27.6	21.71 <sup>30</sup>	52.6 <sup>7</sup>	40.71 <sup>36</sup>	26.0 <sup>28</sup>	22.57 <sup>24</sup>	28.0 <sup>8</sup>	61.88 <sup>27</sup>	30.2 <sup>25</sup>
	26	13	32	30	20	4	24	24
Sept. 6.6	21.97	53.9	41.03	29.0	22.77	27.6	62.12	32.6
16.6	22.18 <sup>21</sup>	55.6 <sup>17</sup>	41.29 <sup>26</sup>	32.1 <sup>31</sup>	22.94 <sup>17</sup>	27.5 <sup>1</sup>	62.32 <sup>20</sup>	35.0 <sup>24</sup>
26.5	22.33 <sup>15</sup>	57.6 <sup>20</sup>	41.50 <sup>21</sup>	35.2 <sup>31</sup>	23.08 <sup>14</sup>	27.6 <sup>1</sup>	62.48 <sup>16</sup>	37.4 <sup>24</sup>
Oct. 6.5	22.43 <sup>10</sup>	59.9 <sup>23</sup>	41.65 <sup>15</sup>	38.2 <sup>30</sup>	23.18 <sup>10</sup>	28.1 <sup>5</sup>	62.60 <sup>12</sup>	39.6 <sup>22</sup>
16.5	22.48 <sup>5</sup>	62.3 <sup>24</sup>	41.75 <sup>10</sup>	41.1 <sup>29</sup>	23.24 <sup>6</sup>	28.8 <sup>7</sup>	62.68 <sup>8</sup>	41.6 <sup>20</sup>
	1	26	5	28	4	8	5	19
26.4	22.47 <sup>6</sup>	64.9	41.80	43.9	23.28	29.6	62.73	43.5
Nov. 5.4	22.41 <sup>10</sup>	67.4 <sup>25</sup>	41.80 <sup>0</sup>	46.5 <sup>26</sup>	23.28 <sup>0</sup>	30.6 <sup>10</sup>	62.74 <sup>1</sup>	45.1 <sup>16</sup>
15.4	22.31 <sup>10</sup>	69.8 <sup>24</sup>	41.75 <sup>5</sup>	48.8 <sup>23</sup>	23.25 <sup>3</sup>	31.7 <sup>11</sup>	62.72 <sup>2</sup>	46.5 <sup>14</sup>
25.4	22.17 <sup>14</sup>	71.9 <sup>21</sup>	41.65 <sup>10</sup>	50.7 <sup>19</sup>	23.21 <sup>4</sup>	32.8 <sup>11</sup>	62.67 <sup>5</sup>	47.6 <sup>11</sup>
Dec. 5.3	22.00 <sup>17</sup>	73.7 <sup>18</sup>	41.52 <sup>13</sup>	52.3 <sup>16</sup>	23.14 <sup>7</sup>	33.9 <sup>11</sup>	62.59 <sup>8</sup>	48.4 <sup>8</sup>
	20	15	18	12	9	10	10	5
15.3	21.80	75.2	41.34	53.5	23.05	34.9	62.49	48.9
25.3	21.59 <sup>21</sup>	76.2 <sup>10</sup>	41.13 <sup>21</sup>	54.1 <sup>6</sup>	22.96 <sup>9</sup>	35.7 <sup>8</sup>	62.36 <sup>13</sup>	49.0 <sup>1</sup>
35.3	21.37 <sup>22</sup>	76.7 <sup>5</sup>	40.90 <sup>23</sup>	54.3 <sup>2</sup>	22.85 <sup>11</sup>	36.5 <sup>8</sup>	62.22 <sup>14</sup>	48.8 <sup>2</sup>
Sec $\delta$ , Tan $\delta$	1.471	-1.079	1.722	+1.402	1.017	-0.188	1.223	+0.705
Mean Place	17°.447	86''.62	36°.265	14''.24	18°.827	56''.92	58°.060	12''.60
D $\phi$ a, D $\alpha$ a	-0.01	+0.07	+0.01	-0.09	0.00	+0.01	+0.01	-0.05
D $\phi$ $\delta$ , D $\alpha$ $\delta$	+0.4	+0.3	+0.4	+0.3	+0.4	+0.3	+0.4	+0.3





FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♊ Piscium. Mag. 4.7		♉ Ceti. Mag. 3.8		♄ Cassiopeiæ. Mag. 2.8		♌ Phœnicis. Mag. 3.4	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m I 14	° ' + 26 49	h m I 19	° ' - 8 36	h m I 20	° ' + 59 47	h m I 24	° ' - 43 44
Jan. 0.3	48.06	17.0	47.32	76.4	15.08	61.2	41.81	81.9
10.3	47.93 <sup>13</sup>	16.6 4	47.22 <sup>10</sup>	77.1 7	14.78 <sup>30</sup>	61.5 3	41.61 <sup>20</sup>	82.4 5
20.2	47.80 <sup>13</sup>	16.0 6	47.10 <sup>12</sup>	77.6 5	14.47 <sup>31</sup>	61.2 3	41.40 <sup>21</sup>	82.4 0
30.2	47.66 <sup>14</sup>	15.1 9	46.98 <sup>12</sup>	77.9 3	14.15 <sup>32</sup>	60.4 8	41.19 <sup>21</sup>	82.0 4
Feb. 9.2	47.53 <sup>13</sup>	14.1 <sup>10</sup>	46.87 <sup>11</sup>	78.1 2	13.84 <sup>31</sup>	59.1 <sup>13</sup>	40.99 <sup>20</sup>	81.0 <sup>10</sup>
		12 12		1 1	28	17	18	14
19.1	47.41	12.9	46.76	78.0	13.56	57.4	40.81	79.6
Mar 1.1	47.31 <sup>10</sup>	11.7 <sup>12</sup>	46.68 8	77.7 3	13.33 <sup>23</sup>	55.4 <sup>20</sup>	40.65 <sup>16</sup>	77.8 <sup>18</sup>
11.1	47.24 7	10.5 <sup>12</sup>	46.61 7	77.2 5	13.15 <sup>18</sup>	53.1 <sup>23</sup>	40.53 <sup>12</sup>	75.7 <sup>21</sup>
21.1	47.21 3	9.3 <sup>12</sup>	46.58 3	76.4 8	13.04 <sup>11</sup>	50.7 <sup>24</sup>	40.44 9	73.2 <sup>25</sup>
31.0	47.22 1	8.2 <sup>11</sup>	46.58 0	75.4 <sup>10</sup>	13.01 3	48.2 <sup>25</sup>	40.40 4	70.4 <sup>28</sup>
	6	8	4	12	5	25	1	30
Apr. 10.0	47.28	7.4	46.62	74.2	13.06	45.7	40.41	67.4
20.0	47.38 <sup>10</sup>	6.7 7	46.70 8	72.7 <sup>15</sup>	13.20 <sup>14</sup>	43.4 <sup>23</sup>	40.47 6	64.2 <sup>32</sup>
30.0	47.53 <sup>15</sup>	6.4 3	46.82 <sup>12</sup>	71.1 <sup>16</sup>	13.42 <sup>22</sup>	41.4 <sup>20</sup>	40.58 <sup>11</sup>	60.9 <sup>33</sup>
May 9.9	47.73 <sup>20</sup>	6.3 1	46.99 <sup>17</sup>	69.2 <sup>19</sup>	13.72 <sup>30</sup>	39.7 <sup>17</sup>	40.75 <sup>17</sup>	57.6 <sup>33</sup>
19.9	47.98 <sup>25</sup>	6.6 3	47.20 <sup>21</sup>	67.1 <sup>21</sup>	14.09 <sup>37</sup>	38.4 <sup>13</sup>	40.97 <sup>22</sup>	54.4 <sup>32</sup>
	28	6	24	21	43	9	27	32
29.9	48.26	7.2	47.44	65.0	14.52	37.5	41.24	51.2
June 8.8	48.57 <sup>31</sup>	8.2 <sup>10</sup>	47.72 <sup>28</sup>	62.8 <sup>22</sup>	15.01 <sup>49</sup>	37.1 4	41.55 <sup>31</sup>	48.3 <sup>29</sup>
18.8	48.90 <sup>33</sup>	9.4 <sup>12</sup>	48.01 <sup>29</sup>	60.6 <sup>22</sup>	15.53 <sup>52</sup>	37.1 0	41.89 <sup>34</sup>	45.6 <sup>27</sup>
28.8	49.25 <sup>35</sup>	10.9 <sup>15</sup>	48.32 <sup>31</sup>	58.5 <sup>21</sup>	16.07 <sup>54</sup>	37.7 6	42.26 <sup>37</sup>	43.3 <sup>23</sup>
July 8.8	49.60 <sup>35</sup>	12.6 <sup>17</sup>	48.64 <sup>32</sup>	56.4 <sup>21</sup>	16.62 <sup>55</sup>	38.7 <sup>10</sup>	42.64 <sup>38</sup>	41.3 <sup>20</sup>
	35	19	32	19	55	14	39	16
18.7	49.95	14.5	48.96	54.5	17.17	40.1	43.03	39.7
28.7	50.29 <sup>34</sup>	16.6 <sup>21</sup>	49.27 <sup>31</sup>	52.8 <sup>17</sup>	17.70 <sup>53</sup>	42.0 <sup>19</sup>	43.41 <sup>38</sup>	38.7 <sup>10</sup>
Aug. 7.7	50.61 <sup>32</sup>	18.7 <sup>21</sup>	49.57 <sup>30</sup>	51.3 <sup>15</sup>	18.20 <sup>50</sup>	44.2 <sup>22</sup>	43.78 <sup>37</sup>	38.1 6
17.7	50.90 <sup>29</sup>	20.9 <sup>22</sup>	49.84 <sup>27</sup>	50.2 <sup>11</sup>	18.67 <sup>47</sup>	46.7 <sup>25</sup>	44.12 <sup>34</sup>	38.1 0
27.6	51.17 <sup>27</sup>	23.1 <sup>22</sup>	50.09 <sup>25</sup>	49.3 9	19.09 <sup>42</sup>	49.5 <sup>28</sup>	44.43 <sup>31</sup>	38.6 5
	23	21	21	6	38	30	27	10
Sept. 6.6	51.40	25.2	50.30	48.7	19.47	52.5	44.70	39.6
16.6	51.60 <sup>20</sup>	27.2 <sup>20</sup>	50.49 <sup>19</sup>	48.5 2	19.78 <sup>31</sup>	55.6 <sup>31</sup>	44.92 <sup>22</sup>	41.0 <sup>14</sup>
26.5	51.76 <sup>16</sup>	29.1 <sup>19</sup>	50.64 <sup>15</sup>	48.6 1	20.04 <sup>26</sup>	58.8 <sup>32</sup>	45.10 <sup>18</sup>	42.8 <sup>18</sup>
Oct. 6.5	51.88 <sup>12</sup>	30.8 <sup>17</sup>	50.75 <sup>11</sup>	48.9 3	20.24 <sup>20</sup>	62.0 <sup>32</sup>	45.22 <sup>12</sup>	45.0 <sup>22</sup>
16.5	51.97 9	32.4 <sup>16</sup>	50.83 8	49.5 6	20.37 <sup>13</sup>	65.1 <sup>31</sup>	45.30 8	47.3 <sup>23</sup>
	6	14	5	8	8	31	3	25
26.5	52.03	33.8	50.88	50.3	20.45	68.2	45.33	49.8
Nov. 5.4	52.05 2	34.9 <sup>11</sup>	50.90 2	51.2 9	20.46 1	71.1 <sup>29</sup>	45.31 2	52.3 <sup>25</sup>
15.4	52.05 0	35.9 <sup>10</sup>	50.89 1	52.2 <sup>10</sup>	20.42 4	73.7 <sup>26</sup>	45.24 7	54.8 <sup>25</sup>
25.4	52.01 4	36.6 7	50.86 3	53.3 <sup>11</sup>	20.31 <sup>11</sup>	76.0 <sup>23</sup>	45.14 <sup>10</sup>	57.1 <sup>23</sup>
Dec. 5.4	51.95 6	37.0 4	50.80 6	54.4 <sup>11</sup>	20.15 <sup>16</sup>	78.0 <sup>20</sup>	45.00 <sup>14</sup>	59.1 <sup>20</sup>
	8	2	7	10	20	15	16	16
15.3	51.87	37.2	50.73	55.4	19.95	79.5	44.84	60.7
25.3	51.77 <sup>10</sup>	37.2 0	50.63 <sup>10</sup>	56.3 9	19.70 <sup>25</sup>	80.6 <sup>11</sup>	44.65 <sup>19</sup>	62.0 <sup>13</sup>
35.3	51.65 <sup>12</sup>	36.9 3	50.53 <sup>10</sup>	57.1 8	19.42 <sup>28</sup>	81.1 5	44.45 <sup>20</sup>	62.8 8
Dec 8, Tan 8	I.121	+0.506	I.011	-0.152	I.988	+1.718	I.384	-0.957
Mean Place	47°-437	3"-41	46°-449	77"-93	14°-640	38"-69	40°-499	73"-17
Δα, Δδ	0.00	-0.03	0.00	+0.01	+0.02	-0.11	-0.01	+0.06
Δα, Δδ	+0.4	+0.3	+0.4	+0.3	+0.4	+0.3	+0.4	+0.4



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	38 Cassiopeiæ. Mag. 6.0		η Piscium. Mag. 3.7		40 Cassiopeiæ. Mag. 5.5		υ Andromedæ. Mag. 4.2	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m I 24	° ' " +69 49	h m I 26	° ' " +14 54	h m I 31	° ' " +72 36	h m I 31	° ' " +40 58
Jan. 0.3	53.38	64.0	56.70	38.7	42.37	51.5	48.81	68.8
10.3	52.90 48	64.5 5	56.59 11	38.2 5	41.80 57	52.2 7	48.65 16	68.8 0
20.2	52.39 51	64.5 0	56.47 12	37.6 6	41.20 60	52.3 1	48.48 17	68.4 4
30.2	51.88 51	63.9 6	56.35 12	36.9 7	40.59 61	51.8 5	48.29 19	67.6 8
Feb. 9.2	51.39 49	62.7 12	56.23 12	36.1 8	40.00 59	50.7 11	48.11 18	66.5 12
	45	17	11	8	54	16	16	14
19.1	50.94	61.0	56.12	35.3	39.46	49.1	47.95	65.1
Mar. 1.1	50.55 39	58.9 21	56.02 10	34.6 7	38.99 47	47.1 20	47.80 15	63.5 16
11.1	50.25 30	56.5 24	55.95 7	33.9 7	38.62 37	44.7 24	47.69 11	61.8 17
21.1	50.05 20	53.9 26	55.91 4	33.4 5	38.36 26	42.1 26	47.63 6	60.0 18
31.0	49.97 8	51.1 28	55.91 0	33.0 4	38.23 13	39.3 28	47.61 2	58.3 17
	3	27	4	2	1	28	3	16
Apr. 10.0	50.00	48.4	55.95	32.8	38.24	36.5	47.64	56.7
20.0	50.16 16	45.8 26	56.04 9	32.9 1	38.39 15	33.7 28	47.74 10	55.2 15
30.0	50.44 28	43.3 25	56.17 13	33.2 3	38.68 29	31.2 25	47.89 15	54.0 12
May 9.9	50.83 39	41.2 21	56.34 17	33.8 6	39.10 42	28.9 23	48.10 21	53.1 9
19.9	51.32 49	39.4 18	56.56 22	34.7 9	39.64 54	27.0 19	48.36 26	52.6 5
	58	13	25	11	64	14	31	2
29.9	51.90	38.1	56.81	35.8	40.28	25.6	48.67	52.4
June 8.8	52.56 66	37.3 8	57.10 29	37.1 13	41.01 73	24.6 10	49.01 34	52.6 2
18.8	53 26 70	37.0 3	57.41 31	38.7 16	41.80 79	24.1 5	49.38 37	53.2 6
28.8	54.00 74	37.2 2	57.73 32	40.4 17	42.63 83	24.1 0	49.77 39	54.1 9
July 8.8	54.76 76	37.8 6	58.06 33	42.2 18	43.49 86	24.6 5	50.17 40	55.4 13
	75	12	33	19	86	11	40	16
18.7	55.51	39.0	58.39	44.1	44.35	25.7	50.57	57.0
28.7	56.25 74	40.7 17	58.71 32	46.1 20	45.19 84	27.2 15	50.96 39	58.9 19
Aug. 7.7	56.95 70	42.8 21	59.02 31	48.0 19	45.99 80	29.1 19	51.33 37	61.0 21
17.7	57.60 65	45.2 24	59.30 28	49.8 18	46.74 75	31.5 24	51.67 34	63.3 23
27.6	58.19 59	48.0 28	59.56 26	51.5 17	47.43 69	34.2 27	51.99 32	65.6 23
	52	30	23	16	61	30	28	25
Sept. 6.6	58.71	51.0	59.79	53.1	48.04	37.2	52.27	68.1
16.6	59.16 45	54.3 33	59.98 19	54.6 15	48.57 53	40.4 32	52.52 25	70.6 25
26.5	59.52 36	57.7 34	60.14 16	55.8 12	49.00 43	43.8 34	52.72 20	73.1 25
Oct. 6.5	59.79 27	61.2 35	60.28 14	56.8 10	49.33 33	47.3 35	52.89 17	75.5 24
16.5	59.98 19	64.7 35	60.38 10	57.7 9	49.56 23	50.9 36	53.01 12	77.8 23
	10	34	6	6	12	35	8	21
26.5	60.08	68.1	60.44	58.3	49.68	54.4	53.09	79.9
Nov. 5.4	60.08 0	71.3 32	60.48 4	58.8 5	49.69 1	57.7 33	53.14 5	81.9 20
15.4	59.99 9	74.4 31	60.49 1	59.0 2	49.60 9	60.9 32	53.14 0	83.6 17
25.4	59.81 18	77.1 27	60.47 2	59.1 1	49.40 20	63.8 29	53.11 3	85.1 15
Dec. 5.4	59.54 27	79.5 24	60.42 5	59.1 0	49.10 30	66.3 25	53.05 6	86.3 12
	34	20	6	2	39	21	10	8
15.3	59.20	81.5	60.36	58.9	48.71	68.4	52.95	87.1
25.3	58.79 41	82.9 14	60.28 8	58.5 4	48.23 48	70.0 16	52.83 12	87.6 5
35.3	58.34 45	83.8 9	60.17 11	58.0 5	47.69 54	71.1 11	52.68 15	87.8 2
Sec δ, Tan δ	2.901	+2.723	1.035	+0.266	3.346	+3.194	1.325	+0.869
Mean Place	52°.980	39''.72	55°.924	28''.83	41°.838	26''.78	48°.127	50''.71
D'ψ a, Dα a	+0.03	-0.18	0.00	-0.02	+0.03	-0.20	+0.01	-0.05
Dψ δ, Dα δ	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\pi$ Piscium. Mag. 5.6		$\upsilon$ Persei. Mag. 3.8		$\alpha$ Eridani. (Achernar.) Mag. 0.6		$\omega$ Cassiopeiæ. Mag. 5.5	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 1 32	° ' " + 11 42	h m 1 32	° ' " + 48 11	h m 1 34	° ' " - 57 39	h m 1 35	° ' " + 67 36
	s	"	s	"	s	"	s	"
Jan. 0.3	36.22	34.3	46.69	72.7	34.74	77.5	62.25	73.2
10.3	36.12 <sup>10</sup>	33.8 <sup>5</sup>	46.49 <sup>20</sup>	72.8 <sup>1</sup>	34.42 <sup>32</sup>	77.9 <sup>4</sup>	61.84 <sup>41</sup>	73.8 <sup>6</sup>
20.2	36.00 <sup>12</sup>	33.1 <sup>7</sup>	46.28 <sup>21</sup>	72.5 <sup>3</sup>	34.09 <sup>33</sup>	77.7 <sup>2</sup>	61.39 <sup>45</sup>	73.9 <sup>1</sup>
30.2	35.88 <sup>12</sup>	32.5 <sup>6</sup>	46.06 <sup>22</sup>	71.7 <sup>8</sup>	33.76 <sup>33</sup>	77.0 <sup>7</sup>	60.93 <sup>46</sup>	73.4 <sup>5</sup>
Feb. 9.2	35.76 <sup>12</sup>	31.8 <sup>7</sup>	45.85 <sup>21</sup>	70.6 <sup>11</sup>	33.45 <sup>31</sup>	75.8 <sup>12</sup>	60.49 <sup>44</sup>	72.3 <sup>11</sup>
	<sup>11</sup>	<sup>6</sup>	<sup>20</sup>	<sup>14</sup>	<sup>29</sup>	<sup>18</sup>	<sup>41</sup>	<sup>15</sup>
19.2	35.65	31.2 <sup>6</sup>	45.65	69.2 <sup>18</sup>	33.16	74.0 <sup>22</sup>	60.08	70.8 <sup>20</sup>
Mar. 1.1	35.55 <sup>10</sup>	30.6 <sup>6</sup>	45.48 <sup>17</sup>	67.4 <sup>18</sup>	32.91 <sup>25</sup>	71.8 <sup>22</sup>	59.72 <sup>36</sup>	68.8 <sup>20</sup>
11.1	35.48 <sup>7</sup>	30.1 <sup>5</sup>	45.34 <sup>14</sup>	65.5 <sup>19</sup>	32.70 <sup>21</sup>	69.2 <sup>26</sup>	59.43 <sup>29</sup>	66.5 <sup>23</sup>
21.1	35.44 <sup>4</sup>	29.7 <sup>4</sup>	45.26 <sup>8</sup>	63.5 <sup>20</sup>	32.53 <sup>17</sup>	66.2 <sup>30</sup>	59.23 <sup>20</sup>	64.0 <sup>25</sup>
31.0	35.43 <sup>1</sup>	29.5 <sup>2</sup>	45.23 <sup>3</sup>	61.4 <sup>21</sup>	32.43 <sup>10</sup>	63.0 <sup>32</sup>	59.13 <sup>10</sup>	61.3 <sup>27</sup>
	<sup>3</sup>	<sup>1</sup>	<sup>3</sup>	<sup>19</sup>	<sup>4</sup>	<sup>35</sup>	<sup>1</sup>	<sup>27</sup>
Apr. 10.0	35.46	29.6 <sup>2</sup>	45.26	59.5 <sup>18</sup>	32.39	59.5 <sup>36</sup>	59.14	58.6 <sup>26</sup>
20.0	35.54 <sup>8</sup>	29.8 <sup>2</sup>	45.36 <sup>10</sup>	57.7 <sup>18</sup>	32.42 <sup>3</sup>	55.9 <sup>36</sup>	59.26 <sup>12</sup>	56.0 <sup>26</sup>
30.0	35.66 <sup>12</sup>	30.3 <sup>5</sup>	45.53 <sup>17</sup>	56.1 <sup>16</sup>	32.52 <sup>10</sup>	52.3 <sup>36</sup>	59.49 <sup>23</sup>	53.6 <sup>24</sup>
May 9.9	35.83 <sup>17</sup>	31.0 <sup>7</sup>	45.76 <sup>23</sup>	54.8 <sup>13</sup>	32.69 <sup>17</sup>	48.7 <sup>36</sup>	59.83 <sup>34</sup>	51.5 <sup>21</sup>
19.9	36.04 <sup>21</sup>	32.0 <sup>10</sup>	46.04 <sup>28</sup>	53.9 <sup>9</sup>	32.93 <sup>24</sup>	45.2 <sup>35</sup>	60.27 <sup>44</sup>	49.8 <sup>17</sup>
	<sup>24</sup>	<sup>13</sup>	<sup>34</sup>	<sup>5</sup>	<sup>30</sup>	<sup>34</sup>	<sup>52</sup>	<sup>14</sup>
29.9	36.28	33.3 <sup>14</sup>	46.38	53.4 <sup>1</sup>	33.23	41.8 <sup>31</sup>	60.79	48.4 <sup>8</sup>
June 8.9	36.56 <sup>28</sup>	34.7 <sup>14</sup>	46.76 <sup>38</sup>	53.3 <sup>1</sup>	33.59 <sup>36</sup>	38.7 <sup>31</sup>	61.37 <sup>58</sup>	47.6 <sup>8</sup>
18.8	36.86 <sup>30</sup>	36.3 <sup>16</sup>	47.17 <sup>41</sup>	53.6 <sup>3</sup>	33.99 <sup>40</sup>	36.0 <sup>27</sup>	62.01 <sup>64</sup>	47.2 <sup>4</sup>
28.8	37.18 <sup>32</sup>	38.1 <sup>18</sup>	47.60 <sup>43</sup>	54.4 <sup>8</sup>	34.43 <sup>44</sup>	33.6 <sup>24</sup>	62.69 <sup>68</sup>	47.3 <sup>1</sup>
July 8.8	37.50 <sup>32</sup>	40.0 <sup>19</sup>	48.04 <sup>44</sup>	55.5 <sup>11</sup>	34.90 <sup>47</sup>	31.7 <sup>19</sup>	63.39 <sup>70</sup>	47.9 <sup>6</sup>
	<sup>33</sup>	<sup>19</sup>	<sup>44</sup>	<sup>15</sup>	<sup>48</sup>	<sup>13</sup>	<sup>69</sup>	<sup>11</sup>
18.7	37.83	41.9 <sup>19</sup>	48.48	57.0 <sup>18</sup>	35.38	30.4 <sup>9</sup>	64.08	49.0 <sup>15</sup>
28.7	38.15 <sup>32</sup>	43.8 <sup>18</sup>	48.91 <sup>43</sup>	58.8 <sup>21</sup>	35.86 <sup>48</sup>	29.5 <sup>3</sup>	64.77 <sup>69</sup>	50.5 <sup>20</sup>
Aug. 7.7	38.45 <sup>30</sup>	45.6 <sup>18</sup>	49.32 <sup>41</sup>	60.9 <sup>23</sup>	36.32 <sup>46</sup>	29.2 <sup>3</sup>	65.42 <sup>65</sup>	52.5 <sup>23</sup>
17.7	38.74 <sup>29</sup>	47.4 <sup>16</sup>	49.70 <sup>38</sup>	63.2 <sup>25</sup>	36.75 <sup>43</sup>	29.5 <sup>9</sup>	66.04 <sup>62</sup>	54.8 <sup>26</sup>
27.6	39.00 <sup>26</sup>	49.0 <sup>14</sup>	50.05 <sup>35</sup>	65.7 <sup>27</sup>	37.15 <sup>40</sup>	30.4 <sup>14</sup>	66.60 <sup>56</sup>	57.4 <sup>30</sup>
	<sup>23</sup>	<sup>14</sup>	<sup>31</sup>	<sup>27</sup>	<sup>35</sup>	<sup>14</sup>	<sup>51</sup>	<sup>30</sup>
Sept. 6.6	39.23	50.4 <sup>13</sup>	50.36	68.4 <sup>27</sup>	37.50	31.8 <sup>18</sup>	67.11	60.4 <sup>31</sup>
16.6	39.43 <sup>20</sup>	51.7 <sup>11</sup>	50.64 <sup>28</sup>	71.1 <sup>28</sup>	37.79 <sup>29</sup>	33.6 <sup>23</sup>	67.54 <sup>43</sup>	63.5 <sup>33</sup>
26.6	39.59 <sup>16</sup>	52.8 <sup>8</sup>	50.86 <sup>22</sup>	73.9 <sup>27</sup>	38.02 <sup>23</sup>	35.9 <sup>26</sup>	67.90 <sup>36</sup>	66.8 <sup>34</sup>
Oct. 6.5	39.73 <sup>14</sup>	53.6 <sup>6</sup>	51.04 <sup>18</sup>	76.6 <sup>26</sup>	38.18 <sup>16</sup>	38.5 <sup>28</sup>	68.19 <sup>29</sup>	70.2 <sup>33</sup>
16.5	39.83 <sup>10</sup>	54.2 <sup>5</sup>	51.18 <sup>14</sup>	79.2 <sup>26</sup>	38.27 <sup>9</sup>	41.3 <sup>29</sup>	68.40 <sup>21</sup>	73.5 <sup>34</sup>
	<sup>7</sup>	<sup>5</sup>	<sup>9</sup>	<sup>26</sup>	<sup>2</sup>	<sup>29</sup>	<sup>12</sup>	<sup>34</sup>
26.5	39.90	54.7 <sup>2</sup>	51.27	81.8 <sup>23</sup>	38.29	44.2 <sup>29</sup>	68.52	76.9 <sup>32</sup>
Nov. 5.4	39.94 <sup>4</sup>	54.9 <sup>1</sup>	51.31 <sup>4</sup>	84.1 <sup>21</sup>	38.24 <sup>5</sup>	47.1 <sup>28</sup>	68.56 <sup>4</sup>	80.1 <sup>30</sup>
15.4	39.96 <sup>2</sup>	55.0 <sup>1</sup>	51.31 <sup>0</sup>	86.2 <sup>19</sup>	38.12 <sup>12</sup>	49.9 <sup>26</sup>	68.51 <sup>5</sup>	83.1 <sup>27</sup>
25.4	39.94 <sup>2</sup>	54.9 <sup>2</sup>	51.27 <sup>8</sup>	88.1 <sup>15</sup>	37.95 <sup>22</sup>	52.5 <sup>22</sup>	68.39 <sup>20</sup>	85.8 <sup>24</sup>
Dec. 5.4	39.90 <sup>6</sup>	54.7 <sup>3</sup>	51.19 <sup>12</sup>	89.6 <sup>12</sup>	37.73 <sup>26</sup>	54.7 <sup>18</sup>	68.19 <sup>28</sup>	88.2 <sup>19</sup>
15.3	39.84 <sup>8</sup>	54.4 <sup>5</sup>	51.07 <sup>15</sup>	90.8 <sup>8</sup>	37.47 <sup>29</sup>	56.5 <sup>13</sup>	67.91 <sup>34</sup>	90.1 <sup>15</sup>
25.3	39.76 <sup>10</sup>	53.9 <sup>5</sup>	50.92 <sup>18</sup>	91.6 <sup>3</sup>	37.18 <sup>32</sup>	57.8 <sup>8</sup>	67.57 <sup>40</sup>	91.6 <sup>10</sup>
35.3	39.66	53.4	50.74	91.9	36.86	58.6	67.17	92.6
Dec 8, Tan 8	1.021	+0.207	1.500	+1.119	1.869	-1.580	2.626	+2.428
Mean Place	35°.397	25''.42	46°.020	52''.66	32°.979	66''.31	61°.604	49''.20
$\Delta\alpha$ , $\Delta\delta$	0.00	-0.01	+0.01	-0.07	-0.02	+0.10	+0.03	-0.15
$\Delta\alpha$ , $\Delta\delta$	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♊ Pisces. Mag. 4.7		♋ Perse. Mag. 4.2		♌ Ceti. Mag. 3.6		♍ Piscu. Mag. 4.	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	D t
	h m 1 37 s	° ' + 5 3 "	h m 1 38 s	° ' + 50 15 "	h m 1 40 s	° ' - 16 22 "	h m 1 40 s	+
Jan. 0.3	1.27	35.1	20.19	60.3	8.17	65.3	55.08	5
10.3	1.16 <sup>11</sup>	34.5 <sup>6</sup>	19.99 <sup>20</sup>	60.5 <sup>2</sup>	8.05 <sup>12</sup>	66.1 <sup>8</sup>	54.97 <sup>11</sup>	5
20.2	1.05 <sup>11</sup>	33.9 <sup>6</sup>	19.77 <sup>22</sup>	60.2 <sup>3</sup>	7.92 <sup>13</sup>	66.6 <sup>5</sup>	54.86 <sup>11</sup>	5
30.2	0.93 <sup>12</sup>	33.3 <sup>6</sup>	19.53 <sup>24</sup>	59.6 <sup>6</sup>	7.79 <sup>13</sup>	66.8 <sup>2</sup>	54.74 <sup>12</sup>	5
Feb. 9.2	0.81 <sup>12</sup>	32.8 <sup>5</sup>	19.30 <sup>23</sup>	58.5 <sup>11</sup>	7.65 <sup>14</sup>	66.8 <sup>0</sup>	54.62 <sup>12</sup>	5
19.2	0.70 <sup>11</sup>	32.3 <sup>5</sup>	19.09 <sup>21</sup>	57.1 <sup>14</sup>	7.52 <sup>13</sup>	66.5 <sup>3</sup>	54.50 <sup>12</sup>	5
Mar. 1.1	0.60 <sup>10</sup>	32.0 <sup>3</sup>	18.90 <sup>19</sup>	55.4 <sup>17</sup>	7.41 <sup>11</sup>	65.9 <sup>6</sup>	54.40 <sup>10</sup>	5
11.1	0.53 <sup>7</sup>	31.8 <sup>2</sup>	18.75 <sup>15</sup>	53.4 <sup>20</sup>	7.32 <sup>9</sup>	65.0 <sup>9</sup>	54.32 <sup>8</sup>	5
21.1	0.48 <sup>5</sup>	31.8 <sup>0</sup>	18.65 <sup>10</sup>	51.3 <sup>21</sup>	7.26 <sup>6</sup>	63.8 <sup>12</sup>	54.27 <sup>5</sup>	5
31.0	0.47 <sup>1</sup>	32.0 <sup>2</sup>	18.61 <sup>4</sup>	49.2 <sup>21</sup>	7.23 <sup>3</sup>	62.4 <sup>14</sup>	54.26 <sup>1</sup>	5
Apr. 10.0	0.50 <sup>3</sup>	32.4 <sup>4</sup>	18.64 <sup>3</sup>	47.2 <sup>20</sup>	7.24 <sup>1</sup>	60.7 <sup>17</sup>	54.28 <sup>2</sup>	5
20.0	0.57 <sup>7</sup>	33.1 <sup>7</sup>	18.73 <sup>9</sup>	45.3 <sup>19</sup>	7.30 <sup>6</sup>	58.8 <sup>19</sup>	54.35 <sup>7</sup>	5
30.0	0.68 <sup>11</sup>	33.9 <sup>8</sup>	18.89 <sup>16</sup>	43.6 <sup>17</sup>	7.40 <sup>10</sup>	56.7 <sup>21</sup>	54.47 <sup>12</sup>	5
May 9.9	0.84 <sup>16</sup>	35.1 <sup>12</sup>	19.12 <sup>23</sup>	42.2 <sup>14</sup>	7.54 <sup>14</sup>	54.4 <sup>23</sup>	54.62 <sup>15</sup>	5
19.9	1.04 <sup>20</sup>	36.4 <sup>13</sup>	19.41 <sup>29</sup>	41.2 <sup>10</sup>	7.72 <sup>18</sup>	52.1 <sup>23</sup>	54.82 <sup>20</sup>	5
29.9	1.28 <sup>24</sup>	37.9 <sup>15</sup>	19.75 <sup>34</sup>	40.5 <sup>7</sup>	7.95 <sup>23</sup>	49.6 <sup>25</sup>	55.06 <sup>24</sup>	5
June 8.9	1.55 <sup>27</sup>	39.6 <sup>17</sup>	20.14 <sup>39</sup>	40.3 <sup>2</sup>	8.21 <sup>26</sup>	47.1 <sup>25</sup>	55.33 <sup>27</sup>	5
18.8	1.84 <sup>29</sup>	41.4 <sup>18</sup>	20.56 <sup>42</sup>	40.5 <sup>2</sup>	8.49 <sup>28</sup>	44.7 <sup>24</sup>	55.62 <sup>29</sup>	6
28.8	2.15 <sup>31</sup>	43.3 <sup>19</sup>	21.00 <sup>44</sup>	41.1 <sup>6</sup>	8.79 <sup>30</sup>	42.4 <sup>23</sup>	55.93 <sup>31</sup>	6
July 8.8	2.47 <sup>32</sup>	45.3 <sup>20</sup>	21.46 <sup>46</sup>	42.1 <sup>10</sup>	9.11 <sup>32</sup>	40.2 <sup>22</sup>	56.26 <sup>33</sup>	6
18.7	2.79 <sup>32</sup>	47.2 <sup>19</sup>	21.91 <sup>45</sup>	43.5 <sup>14</sup>	9.43 <sup>32</sup>	38.3 <sup>19</sup>	56.58 <sup>32</sup>	6
28.7	3.10 <sup>31</sup>	49.0 <sup>18</sup>	22.36 <sup>45</sup>	45.2 <sup>17</sup>	9.75 <sup>32</sup>	36.6 <sup>17</sup>	56.90 <sup>32</sup>	6
Aug. 7.7	3.40 <sup>30</sup>	50.8 <sup>18</sup>	22.79 <sup>43</sup>	47.3 <sup>21</sup>	10.05 <sup>30</sup>	35.2 <sup>14</sup>	57.20 <sup>30</sup>	7
17.7	3.68 <sup>28</sup>	52.4 <sup>16</sup>	23.19 <sup>40</sup>	49.6 <sup>23</sup>	10.33 <sup>28</sup>	34.2 <sup>10</sup>	57.49 <sup>29</sup>	7
27.6	3.94 <sup>26</sup>	53.8 <sup>14</sup>	23.56 <sup>37</sup>	52.1 <sup>25</sup>	10.59 <sup>26</sup>	33.6 <sup>6</sup>	57.75 <sup>26</sup>	7
Sept. 6.6	4.17 <sup>23</sup>	54.9 <sup>11</sup>	23.89 <sup>33</sup>	54.7 <sup>26</sup>	10.83 <sup>24</sup>	33.3 <sup>3</sup>	57.99 <sup>24</sup>	7
16.6	4.37 <sup>20</sup>	55.8 <sup>9</sup>	24.18 <sup>29</sup>	57.5 <sup>28</sup>	11.03 <sup>20</sup>	33.4 <sup>1</sup>	58.19 <sup>20</sup>	7
26.6	4.54 <sup>17</sup>	56.5 <sup>7</sup>	24.42 <sup>24</sup>	60.3 <sup>28</sup>	11.19 <sup>16</sup>	33.9 <sup>5</sup>	58.36 <sup>17</sup>	7
Oct. 6.5	4.68 <sup>14</sup>	57.0 <sup>5</sup>	24.61 <sup>19</sup>	63.0 <sup>27</sup>	11.32 <sup>13</sup>	34.7 <sup>8</sup>	58.51 <sup>15</sup>	7
16.5	4.78 <sup>10</sup>	57.2 <sup>2</sup>	24.76 <sup>15</sup>	65.8 <sup>28</sup>	11.42 <sup>10</sup>	35.7 <sup>10</sup>	58.62 <sup>11</sup>	7
26.5	4.85 <sup>7</sup>	57.2 <sup>0</sup>	24.86 <sup>10</sup>	68.4 <sup>26</sup>	11.48 <sup>6</sup>	36.9 <sup>12</sup>	58.69 <sup>7</sup>	7
Nov. 5.4	4.89 <sup>4</sup>	57.0 <sup>2</sup>	24.91 <sup>5</sup>	70.8 <sup>24</sup>	11.51 <sup>3</sup>	38.3 <sup>14</sup>	58.74 <sup>5</sup>	7
15.4	4.91 <sup>2</sup>	56.7 <sup>3</sup>	24.92 <sup>1</sup>	73.1 <sup>23</sup>	11.51 <sup>0</sup>	39.7 <sup>14</sup>	58.76 <sup>2</sup>	7
25.4	4.90 <sup>1</sup>	56.3 <sup>4</sup>	24.89 <sup>3</sup>	75.0 <sup>19</sup>	11.48 <sup>3</sup>	41.2 <sup>15</sup>	58.75 <sup>1</sup>	7
Dec. 5.4	4.86 <sup>4</sup>	55.8 <sup>5</sup>	24.80 <sup>9</sup>	76.7 <sup>17</sup>	11.42 <sup>6</sup>	42.6 <sup>14</sup>	58.72 <sup>3</sup>	7
15.3	4.80 <sup>6</sup>	55.2 <sup>6</sup>	24.68 <sup>12</sup>	78.0 <sup>13</sup>	11.35 <sup>7</sup>	43.9 <sup>13</sup>	58.67 <sup>5</sup>	7
25.3	4.72 <sup>8</sup>	54.6 <sup>6</sup>	24.52 <sup>16</sup>	78.9 <sup>9</sup>	11.25 <sup>10</sup>	45.0 <sup>11</sup>	58.59 <sup>8</sup>	7
35.3	4.63 <sup>9</sup>	53.9 <sup>7</sup>	24.33 <sup>19</sup>	79.4 <sup>5</sup>	11.13 <sup>12</sup>	45.9 <sup>9</sup>	58.50 <sup>9</sup>	7
Sec δ, Tan δ	1.004	+0.089	1.564	+1.203	1.042	-0.294	1.012	
Mean Place	0°.378	28''.40	19°.473	39''.68	7°.122	64''.87	54°.186	4
D'ψ α, Dω α	0.00	-0.01	+0.01	-0.07	0.00	+0.02	0.00	
Dψ δ, Dω δ	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	+0.4	

FOR THE UPPER TRANSIT AT WASHINGTON.

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\xi$ Piscium. Mag. 4.8		$\beta$ Arietis. Mag. 2.7		$\psi$ Phœnicis. Mag. 4.4		$\nu$ C Mag.
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.
	h m 1 49 s	° ' " + 2 46 "	h m 1 49 s	° ' " + 20 23 "	h m 1 50 s	° ' " - 46 42 "	h m 1 55 s
Jan. 0.3	10.19	12.2	57.34	46.8	15.73	76.6	61.15
10.3	10.09 <sup>10</sup>	11.6 <sup>6</sup>	57.23 <sup>11</sup>	46.4 <sup>4</sup>	15.51 <sup>22</sup>	77.4 <sup>8</sup>	61.03 <sup>12</sup>
20.2	9.97 <sup>12</sup>	11.0 <sup>6</sup>	57.11 <sup>12</sup>	45.9 <sup>5</sup>	15.27 <sup>24</sup>	77.6 <sup>2</sup>	60.89 <sup>14</sup>
30.2	9.85 <sup>12</sup>	10.4 <sup>6</sup>	56.98 <sup>13</sup>	45.2 <sup>7</sup>	15.03 <sup>24</sup>	77.3 <sup>3</sup>	60.74 <sup>15</sup>
Feb. 9.2	9.73 <sup>12</sup>	10.0 <sup>4</sup>	56.84 <sup>14</sup>	44.5 <sup>7</sup>	14.80 <sup>23</sup>	76.6 <sup>7</sup>	60.60 <sup>14</sup>
19.2	9.61 <sup>12</sup>	9.6 <sup>4</sup>	56.71 <sup>13</sup>	43.6 <sup>9</sup>	14.58 <sup>22</sup>	75.3 <sup>13</sup>	60.46 <sup>14</sup>
Mar. 1.1	9.50 <sup>11</sup>	9.4 <sup>2</sup>	56.60 <sup>11</sup>	42.8 <sup>8</sup>	14.38 <sup>20</sup>	73.6 <sup>17</sup>	60.33 <sup>13</sup>
11.1	9.42 <sup>8</sup>	9.3 <sup>1</sup>	56.51 <sup>9</sup>	41.9 <sup>9</sup>	14.21 <sup>17</sup>	71.5 <sup>21</sup>	60.22 <sup>11</sup>
21.1	9.36 <sup>6</sup>	9.4 <sup>1</sup>	56.45 <sup>6</sup>	41.1 <sup>8</sup>	14.08 <sup>13</sup>	69.1 <sup>24</sup>	60.14 <sup>8</sup>
31.1	9.34 <sup>2</sup>	9.7 <sup>3</sup>	56.42 <sup>3</sup>	40.4 <sup>7</sup>	13.99 <sup>9</sup>	66.3 <sup>28</sup>	60.10 <sup>4</sup>
Apr. 10.0	9.35 <sup>1</sup>	10.2 <sup>5</sup>	56.44 <sup>2</sup>	39.9 <sup>5</sup>	13.95 <sup>4</sup>	63.2 <sup>31</sup>	60.09 <sup>1</sup>
20.0	9.41 <sup>6</sup>	11.0 <sup>8</sup>	56.50 <sup>6</sup>	39.6 <sup>3</sup>	13.97 <sup>2</sup>	60.0 <sup>32</sup>	60.13 <sup>4</sup>
30.0	9.51 <sup>10</sup>	12.0 <sup>10</sup>	56.61 <sup>11</sup>	39.5 <sup>1</sup>	14.05 <sup>8</sup>	56.7 <sup>33</sup>	60.21 <sup>8</sup>
May 9.9	9.66 <sup>15</sup>	13.2 <sup>12</sup>	56.77 <sup>16</sup>	39.7 <sup>2</sup>	14.18 <sup>13</sup>	53.3 <sup>34</sup>	60.34 <sup>13</sup>
19.9	9.85 <sup>19</sup>	14.6 <sup>14</sup>	56.98 <sup>21</sup>	40.2 <sup>5</sup>	14.37 <sup>19</sup>	49.9 <sup>34</sup>	60.51 <sup>17</sup>
29.9	10.07 <sup>22</sup>	16.2 <sup>16</sup>	57.22 <sup>24</sup>	40.9 <sup>7</sup>	14.61 <sup>24</sup>	46.6 <sup>33</sup>	60.73 <sup>22</sup>
June 8.9	10.33 <sup>26</sup>	18.0 <sup>18</sup>	57.50 <sup>28</sup>	41.9 <sup>10</sup>	14.90 <sup>29</sup>	43.5 <sup>31</sup>	60.98 <sup>25</sup>
18.8	10.62 <sup>29</sup>	19.9 <sup>19</sup>	57.81 <sup>31</sup>	43.1 <sup>12</sup>	15.23 <sup>33</sup>	40.6 <sup>29</sup>	61.26 <sup>28</sup>
28.8	10.92 <sup>30</sup>	21.8 <sup>19</sup>	58.13 <sup>32</sup>	44.6 <sup>15</sup>	15.60 <sup>37</sup>	38.1 <sup>25</sup>	61.56 <sup>30</sup>
July 8.8	11.24 <sup>32</sup>	23.8 <sup>20</sup>	58.47 <sup>34</sup>	46.2 <sup>16</sup>	15.98 <sup>38</sup>	35.9 <sup>22</sup>	61.88 <sup>32</sup>
18.8	11.56 <sup>32</sup>	25.7 <sup>19</sup>	58.81 <sup>34</sup>	48.0 <sup>18</sup>	16.37 <sup>39</sup>	34.2 <sup>17</sup>	62.21 <sup>33</sup>
28.7	11.87 <sup>31</sup>	27.5 <sup>18</sup>	59.14 <sup>33</sup>	49.8 <sup>18</sup>	16.77 <sup>40</sup>	33.0 <sup>12</sup>	62.53 <sup>32</sup>
Aug. 7.7	12.18 <sup>31</sup>	29.2 <sup>17</sup>	59.46 <sup>32</sup>	51.6 <sup>18</sup>	17.15 <sup>38</sup>	32.2 <sup>8</sup>	62.85 <sup>32</sup>
17.7	12.46 <sup>28</sup>	30.7 <sup>15</sup>	59.76 <sup>30</sup>	53.5 <sup>19</sup>	17.52 <sup>37</sup>	32.1 <sup>1</sup>	63.15 <sup>30</sup>
27.6	12.73 <sup>27</sup>	32.0 <sup>13</sup>	60.04 <sup>28</sup>	55.3 <sup>18</sup>	17.86 <sup>34</sup>	32.5 <sup>4</sup>	63.42 <sup>27</sup>
Sept. 6.6	12.96 <sup>23</sup>	33.0 <sup>10</sup>	60.30 <sup>26</sup>	57.0 <sup>17</sup>	18.17 <sup>31</sup>	32.5 <sup>9</sup>	63.67 <sup>25</sup>
16.6	13.17 <sup>21</sup>	33.8 <sup>8</sup>	60.52 <sup>22</sup>	58.6 <sup>16</sup>	18.43 <sup>26</sup>	33.4 <sup>14</sup>	63.67 <sup>22</sup>
26.6	13.35 <sup>18</sup>	34.4 <sup>6</sup>	60.71 <sup>19</sup>	58.6 <sup>16</sup>	18.43 <sup>26</sup>	34.8 <sup>14</sup>	63.89 <sup>22</sup>
Oct. 6.5	13.35 <sup>15</sup>	34.4 <sup>6</sup>	60.71 <sup>19</sup>	60.0 <sup>14</sup>	18.64 <sup>21</sup>	36.6 <sup>18</sup>	64.08 <sup>19</sup>
16.5	13.50 <sup>15</sup>	34.6 <sup>2</sup>	60.87 <sup>16</sup>	60.0 <sup>14</sup>	18.64 <sup>21</sup>	36.6 <sup>18</sup>	64.08 <sup>19</sup>
26.5	13.61 <sup>11</sup>	34.6 <sup>2</sup>	60.87 <sup>16</sup>	61.3 <sup>13</sup>	18.80 <sup>16</sup>	38.8 <sup>22</sup>	64.23 <sup>15</sup>
Nov. 5.5	13.61 <sup>8</sup>	34.7 <sup>1</sup>	61.00 <sup>13</sup>	62.5 <sup>12</sup>	18.91 <sup>11</sup>	41.3 <sup>25</sup>	64.34 <sup>11</sup>
15.4	13.69 <sup>6</sup>	34.5 <sup>3</sup>	61.09 <sup>6</sup>	63.4 <sup>9</sup>	18.96 <sup>5</sup>	44.0 <sup>27</sup>	64.42 <sup>8</sup>
25.4	13.75 <sup>2</sup>	34.2 <sup>3</sup>	61.15 <sup>6</sup>	64.1 <sup>7</sup>	18.97 <sup>1</sup>	46.7 <sup>27</sup>	64.47 <sup>5</sup>
Dec. 5.4	13.77 <sup>0</sup>	33.8 <sup>4</sup>	61.19 <sup>4</sup>	64.7 <sup>6</sup>	18.97 <sup>1</sup>	46.7 <sup>27</sup>	64.47 <sup>5</sup>
15.3	13.77 <sup>0</sup>	33.8 <sup>4</sup>	61.19 <sup>4</sup>	64.7 <sup>6</sup>	18.93 <sup>4</sup>	49.3 <sup>26</sup>	64.48 <sup>1</sup>
25.3	13.77 <sup>3</sup>	33.2 <sup>6</sup>	61.19 <sup>0</sup>	65.1 <sup>4</sup>	18.84 <sup>9</sup>	51.8 <sup>25</sup>	64.46 <sup>2</sup>
35.3	13.74 <sup>5</sup>	32.5 <sup>7</sup>	61.16 <sup>3</sup>	65.3 <sup>2</sup>	18.84 <sup>9</sup>	51.8 <sup>25</sup>	64.46 <sup>2</sup>
15.3	13.69 <sup>7</sup>	31.8 <sup>7</sup>	61.11 <sup>7</sup>	65.4 <sup>2</sup>	18.71 <sup>13</sup>	54.1 <sup>23</sup>	64.42 <sup>4</sup>
25.3	13.62 <sup>7</sup>	31.1 <sup>7</sup>	61.04 <sup>7</sup>	65.2 <sup>2</sup>	18.71 <sup>17</sup>	54.1 <sup>20</sup>	64.42 <sup>8</sup>
35.3	13.53 <sup>9</sup>	30.5 <sup>6</sup>	60.94 <sup>10</sup>	64.9 <sup>3</sup>	18.54 <sup>19</sup>	56.1 <sup>15</sup>	64.34 <sup>10</sup>
					18.35 <sup>21</sup>	57.6 <sup>11</sup>	64.24 <sup>11</sup>
					18.14 <sup>21</sup>	58.7 <sup>11</sup>	64.13 <sup>11</sup>
Sec $\delta$ , Tan $\delta$	1.001	+0.048	1.067	+0.372	1.458	-1.062	1.075
Mean Place	9 <sup>s</sup> .215	6 <sup>''</sup> .08	56 <sup>s</sup> .440	34 <sup>''</sup> .70	14 <sup>s</sup> .194	68 <sup>''</sup> .20	59 <sup>s</sup> .966
D' $\psi$ $a$ , D $\omega$ $a$	0.00	0.00	0.00	-0.02	-0.01	+0.06	-0.01
D' $\psi$ $\delta$ , D $\omega$ $\delta$	+0.4	+0.5	+0.4	+0.5	+0.4	+0.5	+0.3

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\alpha$ Hydri. Mag. 3.0		50 Cassiopeiæ. Mag. 4.1		$\gamma$ Andromedæ <i>pr.</i> Mag. 2.3		$\alpha$ Arietis. Mag. 2.2	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 1 56 s	° ' " — 61 58 "	h m 1 56 s	° ' " + 72 0 "	h m 1 58 s	° ' " + 41 55 "	h m 2 2 s	° ' " + 23 3 "
Jan. 0.3	7.22	70.4	10.03	62.9	41.45	39.2	23.65	52.8
10.3	6.84 38	71.0 6	9.51 52	63.9 10	41.30 15	39.4 2	23.54 11	52.5 3
20.3	6.44 40	71.0 0	8.94 57	64.4 5	41.12 18	39.2 2	23.42 12	52.1 4
30.2	6.03 41	70.5 5	8.35 59	64.2 2	40.93 19	38.7 5	23.29 13	51.5 6
Feb. 9.2	5.64 39	69.4 11	7.77 58	63.4 8	40.74 19	37.8 9	23.14 15	50.8 7
	37	17	55	13	18	11	14	9
19.2	5.27	67.7	7.22	62.1	40.56	36.7	23.00	49.9
Mar. 1.1	4.93 34	65.6 21	6.73 49	60.4 17	40.39 17	35.3 14	22.88 12	49.0 9
11.1	4.64 29	63.1 25	6.31 42	58.2 22	40.25 14	33.7 16	22.78 10	48.1 9
21.1	4.40 24	60.2 29	6.00 31	55.7 25	40.16 9	32.0 17	22.70 8	47.2 9
31.1	4.23 17	57.0 32	5.81 19	53.0 27	40.11 5	30.3 17	22.66 4	46.4 8
	11	35	6	27	0	16	1	7
Apr. 10.0	4.12	53.5	5.75	50.3	40.11	28.7	22.67	45.7
20.0	4.10 2	49.9 36	5.83 8	47.5 28	40.17 6	27.1 16	22.72 5	45.3 4
30.0	4.15 5	46.2 37	6.04 21	44.9 26	40.29 12	25.8 13	22.82 10	45.0 3
May 10.0	4.28 13	42.5 37	6.39 35	42.6 23	40.47 18	24.8 10	22.98 16	45.0 0
19.9	4.49 21	38.9 36	6.85 46	40.5 21	40.71 24	24.0 8	23.17 19	45.2 2
	29	35	58	17	29	4	24	6
29.9	4.78	35.4	7.43	38.8	41.00	23.6	23.41	45.8
June 8.9	5.13 35	32.2 32	8.10 67	37.5 13	41.33 33	23.5 1	23.69 28	46.6 8
18.8	5.54 41	29.3 29	8.84 74	36.8 7	41.69 36	23.9 4	23.99 30	47.6 10
28.8	6.00 46	26.7 26	9.64 80	36.5 3	42.08 39	24.6 7	24.31 32	48.9 13
July 8.8	6.50 50	24.7 20	10.47 83	36.7 2	42.48 40	25.6 10	24.65 34	50.4 15
	52	16	84	7	40	13	35	16
18.8	7.02	23.1	11.31	37.4	42.88	26.9	25.00	52.0
28.7	7.54 52	22.1 10	12.15 84	38.6 12	43.28 40	28.5 16	25.34 34	53.7 17
Aug. 7.7	8.06 52	21.7 4	12.97 82	40.2 16	43.67 39	30.3 18	25.67 33	55.5 18
17.7	8.56 50	21.9 2	13.74 77	42.3 21	44.04 37	32.3 20	25.99 32	57.4 19
27.7	9.02 46	22.6 7	14.46 72	44.7 24	44.39 35	34.5 22	26.28 29	59.2 18
	41	14	66	27	31	23	26	17
Sept. 6.6	9.43	24.0	15.12	47.4	44.70	36.8	26.54	60.9
16.6	9.79 36	25.8 18	15.70 58	50.4 30	44.98 28	39.2 24	26.78 24	62.6 17
26.6	10.07 28	28.1 23	16.20 50	53.6 32	45.22 24	41.6 24	26.99 21	64.1 15
Oct. 6.5	10.28 21	30.7 26	16.61 41	57.0 34	45.43 21	43.9 23	27.16 17	65.5 14
16.5	10.42 14	33.6 29	16.92 31	60.4 34	45.59 16	46.1 22	27.30 14	66.7 12
	5	31	21	34	12	22	11	11
26.5	10.47	36.7	17.13	63.8	45.71	48.3	27.41	67.8
Nov. 5.5	10.44 3	39.7 30	17.23 10	67.2 34	45.80 9	50.3 20	27.49 8	68.7 9
15.4	10.33 11	42.7 30	17.22 1	70.4 32	45.84 4	52.1 18	27.54 5	69.4 7
25.4	10.16 17	45.5 28	17.11 11	73.4 30	45.84 0	53.7 16	27.55 1	69.9 5
Dec. 5.4	9.92 24	47.9 24	16.89 22	76.0 26	45.81 3	55.1 14	27.54 1	70.3 4
	30	21	31	23	7	10	5	2
15.4	9.62	50.0	16.58	78.3	45.74	56.1	27.49	70.5
25.3	9.28 34	51.5 15	16.18 40	80.2 19	45.63 11	56.8 7	27.42 7	70.5 0
35.3	8.91 37	52.5 10	15.69 49	81.5 13	45.49 14	57.2 4	27.33 9	70.3 2
at Tan $\delta$	2.129	—1.879	3.239	+3.081	1.344	+0.898	1.087	+0.426
Place	5°.081	59''.49	8°.901	38''.42	40°.520	20''.73	22°.676	39''.78
$\Delta\alpha$ , $\Delta\delta$	—0.02	+0.11	+0.04	—0.18	+0.01	—0.05	+0.01	—0.02
$\delta$ , $\Delta\delta$	+0.3	+0.5	+0.3	+0.5	+0.3	+0.5	+0.3	+0.5



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Trianguli. Mag. 3.1		$\delta$ Cassiopeie. Mag. 6.2		$\epsilon$ Persei. Mag. 5.4		$\xi$ Ceti. Mag. 4.5	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 2 4	° ' " + 34 35	h m 2 7	° ' " + 66 7	h m 2 7	° ' " + 50 40	h m 2 8	° ' " + 8 26
Jan. 0.3	29.82	25.3 0	48.84	59.8 10	57.66	38.2 5	30.61	62.6 6
10.3	29.69	25.3 3	48.48	60.8 4	57.47	38.7 1	30.51	62.0 6
20.3	29.55	25.0 5	48.08	61.2 1	57.25	38.8 4	30.40	61.4 6
30.2	29.39	24.5 8	47.66	61.1 7	57.02	38.4 12	30.28	60.8 5
Feb. 9.2	29.22	23.7 10	47.24	60.4 12	56.77	37.7 23	30.15	60.3 5
19.2	29.05	22.7 12	46.83	59.2 16	56.54	36.5 15	30.02	59.8 4
Mar. 1.1	28.91	21.5 13	46.45	57.6 20	56.33	35.0 17	29.90	59.4 3
11.1	28.78	20.2 14	46.13	55.6 23	56.15	33.3 19	29.80	59.1 2
21.1	28.69	18.8 14	45.89	53.3 25	56.01	31.4 21	29.73	58.9 0
31.1	28.65	17.4 13	45.73	50.8 26	55.93	29.3 20	29.69	58.9 2
Apr. 10.0	28.65	16.1 11	45.67	48.2 25	55.91	27.3 19	29.69	59.1 3
20.0	28.70	15.0 9	45.72	45.7 24	55.97	25.4 18	29.73	59.4 6
30.0	28.81	14.1 7	45.87	43.3 23	56.09	23.6 16	29.82	60.0 8
May 10.0	28.97	13.4 4	46.13	41.0 19	56.28	22.0 12	29.95	60.8 11
19.9	29.18	13.0 1	46.49	39.1 16	56.54	20.8 9	30.12	61.9 13
29.9	29.44	12.9 3	46.93	37.5 11	56.85	19.9 6	30.34	63.2 14
June 8.9	29.74	13.2 5	47.45	36.4 7	57.21	19.3 1	30.59	64.6 17
18.8	30.07	13.7 9	48.03	35.7 3	57.62	19.2 3	30.87	66.3 17
28.8	30.43	14.6 12	48.66	35.4 2	58.06	20.1 10	31.17	68.0 18
July 8.8	30.80	15.8 14	49.31	35.6 7	58.51	21.1 14	31.48	69.8 17
18.8	31.17	17.2 16	49.98	37.4 16	58.97	22.5 17	31.81	71.6 17
28.7	31.54	18.8 18	50.65	39.0 19	59.43	24.2 20	32.13	73.3 17
Aug. 7.7	31.91	20.6 20	51.30	40.9 23	59.88	26.2 22	32.44	75.0 16
17.7	32.25	22.6 20	51.93	43.2 25	60.31	28.4 24	32.73	76.6 14
27.7	32.58	24.6 20	52.51	45.7 28	60.71	30.8 25	33.01	78.0 13
Sept. 6.6	32.87	26.6 21	53.05	48.5 30	61.08	33.3 26	33.26	79.3 10
16.6	33.13	28.7 20	53.54	51.5 32	61.41	35.9 26	33.49	80.3 8
26.6	33.36	30.7 20	53.96	54.7 32	61.70	38.5 26	33.69	81.1 6
Oct. 6.5	33.56	32.7 19	54.31	57.9 32	61.95	41.1 26	33.86	81.7 3
16.5	33.72	34.6 17	54.59	61.1 31	62.15	43.7 24	33.99	82.0 1
26.5	33.84	36.3 16	54.80	64.2 30	62.30	46.1 23	34.10	82.2 0
Nov. 5.5	33.93	37.9 14	54.92	67.2 28	62.41	48.4 21	34.18	82.2 3
15.4	33.98	40.5 10	54.97	72.5 22	62.46	50.5 18	34.22	82.0 3
25.4	33.99	41.5 7	54.93	74.7 17	62.47	52.3 15	34.24	81.7 4
Dec. 5.4	33.97	42.2 5	54.82	76.4 13	62.43	53.8 12	34.23	81.3 5
15.4	33.92	42.7 2	54.63	77.7 13	62.34	55.0 7	34.19	80.8 5
25.3	33.84	42.9 2	54.37		62.21		34.13	80.3 6
35.3	33.73		54.04		62.04		34.05	79.7
Sec $\delta$ , Tan $\delta$	1.215	+0.690	2.471	+2.260	1.578	+1.221	1.011	+0.149
Mean Place	28°.842	8'-.76	47°.612	36'-.26	56°.608	17'-.60	29°.556	54'-.17
$D\phi\alpha$ , $D_\alpha\alpha$	+0.01	-0.04	+0.03	-0.13	+0.02	-0.07	0.00	-0.01
$D\phi\delta$ , $D_\delta\delta$	+0.3	+0.5	+0.3	+0.5	+0.3	+0.5	+0.3	+0.5

{Eph 15}

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Fornacis. Mag. 5.2		$\gamma$ Trianguli. Mag. 4.1		67 Ceti. Mag. 5.7		$\phi$ Eridani. Mag. 3.8	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 2 9 s	° ' " — 31 6 "	h m 2 12 s	° ' " + 33 27 "	h m 2 12 s	° ' " — 6 48 "	h m 2 13 s	° ' " — 51 53 "
Jan. 0.3	10.99	84.8	16.41	32.9	45.71	44.9	30.10	87.7
10.3	10.84 <sup>15</sup>	85.8 <sup>10</sup>	16.29 <sup>12</sup>	32.9 <sup>0</sup>	45.61 <sup>10</sup>	45.7 <sup>8</sup>	29.84 <sup>26</sup>	88.7 <sup>10</sup>
20.3	10.68 <sup>16</sup>	86.4 <sup>6</sup>	16.15 <sup>14</sup>	32.7 <sup>2</sup>	45.49 <sup>12</sup>	46.4 <sup>7</sup>	29.56 <sup>28</sup>	89.2 <sup>5</sup>
30.2	10.51 <sup>17</sup>	86.6 <sup>2</sup>	15.99 <sup>16</sup>	32.2 <sup>5</sup>	45.36 <sup>13</sup>	46.9 <sup>5</sup>	29.27 <sup>29</sup>	89.1 <sup>1</sup>
Feb. 9.2	10.33 <sup>18</sup>	86.4 <sup>2</sup>	15.82 <sup>17</sup>	31.5 <sup>7</sup>	45.23 <sup>13</sup>	47.2 <sup>3</sup>	28.99 <sup>28</sup>	88.4 <sup>7</sup>
19.2	10.16 <sup>17</sup>	85.8 <sup>6</sup>	15.66 <sup>16</sup>	30.5 <sup>10</sup>	45.10 <sup>13</sup>	47.4 <sup>2</sup>	28.71 <sup>28</sup>	87.3 <sup>11</sup>
Mar. 1.2	10.01 <sup>15</sup>	84.8 <sup>10</sup>	15.51 <sup>15</sup>	30.5 <sup>11</sup>	45.10 <sup>13</sup>	47.4 <sup>1</sup>	28.71 <sup>26</sup>	87.3 <sup>16</sup>
11.1	9.87 <sup>14</sup>	83.4 <sup>14</sup>	15.51 <sup>15</sup>	29.4 <sup>11</sup>	44.97 <sup>13</sup>	47.3 <sup>1</sup>	28.45 <sup>26</sup>	85.7 <sup>16</sup>
21.1	9.87 <sup>11</sup>	83.4 <sup>14</sup>	15.38 <sup>13</sup>	28.2 <sup>12</sup>	44.87 <sup>10</sup>	46.9 <sup>4</sup>	28.22 <sup>23</sup>	83.6 <sup>21</sup>
31.1	9.76 <sup>11</sup>	81.7 <sup>17</sup>	15.29 <sup>9</sup>	26.9 <sup>13</sup>	44.79 <sup>8</sup>	46.4 <sup>5</sup>	28.03 <sup>19</sup>	81.1 <sup>25</sup>
Apr. 10.0	9.69 <sup>7</sup>	79.7 <sup>20</sup>	15.23 <sup>6</sup>	25.6 <sup>13</sup>	44.74 <sup>5</sup>	45.6 <sup>8</sup>	27.89 <sup>14</sup>	78.3 <sup>28</sup>
20.0	9.66 <sup>3</sup>	77.4 <sup>23</sup>	15.23 <sup>0</sup>	24.4 <sup>12</sup>	44.72 <sup>2</sup>	45.6 <sup>11</sup>	27.89 <sup>9</sup>	78.3 <sup>31</sup>
30.0	9.67 <sup>1</sup>	74.8 <sup>26</sup>	15.27 <sup>4</sup>	23.3 <sup>11</sup>	44.72 <sup>3</sup>	44.5 <sup>13</sup>	27.80 <sup>3</sup>	75.2 <sup>33</sup>
May 10.0	9.73 <sup>6</sup>	72.1 <sup>27</sup>	15.37 <sup>10</sup>	22.4 <sup>9</sup>	44.75 <sup>8</sup>	43.2 <sup>15</sup>	27.77 <sup>3</sup>	71.9 <sup>35</sup>
19.9	9.84 <sup>11</sup>	69.2 <sup>29</sup>	15.37 <sup>10</sup>	22.4 <sup>9</sup>	44.83 <sup>8</sup>	41.7 <sup>15</sup>	27.80 <sup>3</sup>	68.4 <sup>35</sup>
29.9	9.84 <sup>16</sup>	66.3 <sup>29</sup>	15.52 <sup>15</sup>	21.8 <sup>6</sup>	44.95 <sup>12</sup>	40.1 <sup>16</sup>	27.90 <sup>10</sup>	64.9 <sup>35</sup>
June 8.9	10.00 <sup>20</sup>	66.3 <sup>30</sup>	15.72 <sup>20</sup>	21.4 <sup>4</sup>	45.11 <sup>16</sup>	38.2 <sup>19</sup>	27.90 <sup>16</sup>	61.4 <sup>35</sup>
18.9	10.20 <sup>25</sup>	63.3 <sup>29</sup>	15.97 <sup>25</sup>	21.4 <sup>1</sup>	45.11 <sup>20</sup>	38.2 <sup>20</sup>	28.06 <sup>22</sup>	61.4 <sup>35</sup>
28.8	10.45 <sup>28</sup>	60.4 <sup>29</sup>	15.97 <sup>29</sup>	21.3 <sup>3</sup>	45.31 <sup>24</sup>	36.2 <sup>21</sup>	28.28 <sup>28</sup>	57.9 <sup>33</sup>
July 8.8	10.73 <sup>31</sup>	57.6 <sup>28</sup>	16.26 <sup>29</sup>	21.6 <sup>6</sup>	45.55 <sup>27</sup>	34.1 <sup>22</sup>	28.56 <sup>28</sup>	54.6 <sup>33</sup>
18.8	11.04 <sup>32</sup>	55.0 <sup>26</sup>	16.59 <sup>33</sup>	22.2 <sup>8</sup>	45.82 <sup>27</sup>	31.9 <sup>22</sup>	28.89 <sup>33</sup>	51.6 <sup>30</sup>
28.7	11.36 <sup>34</sup>	52.7 <sup>23</sup>	16.94 <sup>35</sup>	23.0 <sup>8</sup>	46.11 <sup>29</sup>	29.8 <sup>21</sup>	29.25 <sup>36</sup>	48.9 <sup>27</sup>
Aug. 7.7	11.70 <sup>34</sup>	50.7 <sup>16</sup>	17.30 <sup>36</sup>	24.1 <sup>11</sup>	46.41 <sup>30</sup>	27.7 <sup>21</sup>	29.65 <sup>40</sup>	46.6 <sup>23</sup>
17.7	12.04 <sup>34</sup>	49.1 <sup>16</sup>	17.67 <sup>37</sup>	24.1 <sup>14</sup>	46.41 <sup>32</sup>	27.7 <sup>19</sup>	29.65 <sup>42</sup>	46.6 <sup>19</sup>
27.7	12.37 <sup>33</sup>	47.9 <sup>12</sup>	18.04 <sup>37</sup>	25.5 <sup>16</sup>	46.73 <sup>31</sup>	25.8 <sup>18</sup>	30.07 <sup>42</sup>	44.7 <sup>14</sup>
Sept. 6.6	12.69 <sup>32</sup>	47.2 <sup>7</sup>	18.40 <sup>36</sup>	27.1 <sup>16</sup>	47.04 <sup>31</sup>	24.0 <sup>18</sup>	30.49 <sup>42</sup>	43.3 <sup>8</sup>
16.6	12.99 <sup>30</sup>	47.0 <sup>2</sup>	18.74 <sup>34</sup>	28.8 <sup>17</sup>	47.35 <sup>31</sup>	22.5 <sup>15</sup>	30.91 <sup>42</sup>	42.5 <sup>2</sup>
26.6	13.26 <sup>24</sup>	47.2 <sup>7</sup>	19.07 <sup>30</sup>	30.7 <sup>19</sup>	47.64 <sup>29</sup>	21.2 <sup>13</sup>	31.31 <sup>40</sup>	42.3 <sup>2</sup>
Oct. 6.6	13.50 <sup>21</sup>	47.9 <sup>12</sup>	19.37 <sup>26</sup>	32.6 <sup>19</sup>	47.92 <sup>28</sup>	20.2 <sup>10</sup>	31.70 <sup>39</sup>	42.6 <sup>3</sup>
16.5	13.71 <sup>17</sup>	49.1 <sup>15</sup>	19.63 <sup>24</sup>	34.6 <sup>19</sup>	48.17 <sup>22</sup>	20.2 <sup>7</sup>	32.04 <sup>31</sup>	43.5 <sup>14</sup>
26.5	13.88 <sup>13</sup>	50.6 <sup>18</sup>	19.87 <sup>20</sup>	36.5 <sup>19</sup>	48.39 <sup>22</sup>	19.5 <sup>3</sup>	32.35 <sup>26</sup>	44.9 <sup>14</sup>
Nov. 5.5	14.01 <sup>8</sup>	52.4 <sup>20</sup>	20.07 <sup>17</sup>	38.5 <sup>20</sup>	48.59 <sup>20</sup>	19.2 <sup>0</sup>	32.61 <sup>20</sup>	46.8 <sup>19</sup>
15.4	14.09 <sup>5</sup>	54.4 <sup>22</sup>	20.24 <sup>13</sup>	40.4 <sup>19</sup>	48.76 <sup>17</sup>	19.2 <sup>2</sup>	32.81 <sup>20</sup>	49.1 <sup>23</sup>
25.4	14.14 <sup>2</sup>	56.6 <sup>23</sup>	20.37 <sup>9</sup>	42.2 <sup>16</sup>	48.89 <sup>13</sup>	19.4 <sup>6</sup>	32.96 <sup>15</sup>	51.7 <sup>26</sup>
Dec. 5.4	14.16 <sup>3</sup>	58.9 <sup>23</sup>	20.46 <sup>6</sup>	43.8 <sup>15</sup>	48.99 <sup>8</sup>	20.0 <sup>8</sup>	32.96 <sup>8</sup>	51.7 <sup>28</sup>
15.4	14.13 <sup>6</sup>	61.1 <sup>22</sup>	20.52 <sup>3</sup>	45.3 <sup>13</sup>	49.07 <sup>8</sup>	20.8 <sup>9</sup>	33.04 <sup>3</sup>	54.5 <sup>30</sup>
25.3	14.07 <sup>8</sup>	63.1 <sup>19</sup>	20.55 <sup>1</sup>	46.6 <sup>13</sup>	49.11 <sup>4</sup>	21.7 <sup>9</sup>	33.07 <sup>3</sup>	57.5 <sup>29</sup>
35.3	13.99 <sup>11</sup>	65.0 <sup>16</sup>	20.54 <sup>4</sup>	47.8 <sup>12</sup>	49.12 <sup>1</sup>	22.8 <sup>11</sup>	33.04 <sup>8</sup>	60.4 <sup>28</sup>
Jan 8, Tan 8	1.168	—0.604	1.199	—0.01	1.007	—0.119	1.621	—0.02
Mean Place	9 <sup>h</sup> .631	80 <sup>m</sup> '' .88	15 <sup>h</sup> .373	—0.04	44 <sup>h</sup> .552	48 <sup>m</sup> '' .36	28 <sup>h</sup> .273	+0.07
Dec 8, Dec 8	—0.01	+0.03	+0.01	+0.5	0.00	+0.01	—0.02	+0.07
Dec 8, Dec 8	+0.3	+0.5	+0.3	+0.5	+0.3	+0.5	+0.3	+0.5



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	o Ceti. (Mira.) Var. 1.7-9.6		κ Fornacis. Mag. 5.4		δ Hydri. Mag. 4.3		ι Cassiope Mag. 4.	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	
	h m 2 15 s	° ' " — 3 21 "	h m 2 18 s	° ' " — 24 11 "	h m 2 20 s	° ' " — 69 2 "	h m 2 22 s	
Jan. 0.3	4.24	42.1	40.48	69.8	16.82	55.8	4.22	
10.3	4.14 <sup>10</sup>	42.9 <sup>8</sup>	40.35 <sup>13</sup>	70.8 <sup>10</sup>	16.28 <sup>54</sup>	56.6 <sup>8</sup>	3.86 <sup>36</sup>	
20.3	4.03 <sup>11</sup>	43.5 <sup>6</sup>	40.21 <sup>14</sup>	71.5 <sup>7</sup>	15.71 <sup>57</sup>	56.9 <sup>3</sup>	3.45 <sup>41</sup>	
30.2	3.90 <sup>13</sup>	44.1 <sup>6</sup>	40.06 <sup>15</sup>	71.9 <sup>4</sup>	15.13 <sup>58</sup>	56.6 <sup>3</sup>	3.01 <sup>44</sup>	
Feb. 9.2	3.77 <sup>13</sup>	44.5 <sup>4</sup>	39.90 <sup>16</sup>	71.9 <sup>0</sup>	14.56 <sup>57</sup>	55.7 <sup>9</sup>	2.57 <sup>44</sup>	
					56	15	44	
19.2	3.64	44.7	39.74	71.6	14.00	54.2	2.13	
Mar. 1.2	3.52 <sup>12</sup>	44.7 <sup>0</sup>	39.59 <sup>15</sup>	70.9 <sup>7</sup>	13.48 <sup>52</sup>	52.2 <sup>20</sup>	1.72 <sup>41</sup>	
11.1	3.41 <sup>11</sup>	44.5 <sup>2</sup>	39.46 <sup>13</sup>	69.9 <sup>10</sup>	13.02 <sup>46</sup>	49.7 <sup>25</sup>	1.37 <sup>35</sup>	
21.1	3.33 <sup>8</sup>	44.1 <sup>4</sup>	39.36 <sup>10</sup>	68.5 <sup>14</sup>	12.62 <sup>40</sup>	46.9 <sup>28</sup>	1.08 <sup>29</sup>	
31.1	3.28 <sup>5</sup>	43.5 <sup>6</sup>	39.28 <sup>8</sup>	66.8 <sup>17</sup>	12.29 <sup>33</sup>	43.7 <sup>32</sup>	0.89 <sup>19</sup>	
					23	34	9	
Apr. 10.0	3.27	42.7	39.25	64.9	12.06	40.3	0.80	
20.0	3.30 <sup>3</sup>	41.6 <sup>11</sup>	39.26 <sup>1</sup>	62.7 <sup>22</sup>	11.93 <sup>13</sup>	36.6 <sup>37</sup>	0.81 <sup>1</sup>	
30.0	3.37 <sup>7</sup>	40.3 <sup>13</sup>	39.32 <sup>6</sup>	60.3 <sup>24</sup>	11.89 <sup>4</sup>	32.9 <sup>37</sup>	0.94 <sup>13</sup>	
May 10.0	3.49 <sup>12</sup>	38.8 <sup>15</sup>	39.42 <sup>10</sup>	57.8 <sup>25</sup>	11.96 <sup>7</sup>	29.1 <sup>38</sup>	1.17 <sup>23</sup>	
19.9	3.65 <sup>16</sup>	37.2 <sup>16</sup>	39.57 <sup>15</sup>	55.1 <sup>27</sup>	12.13 <sup>17</sup>	25.4 <sup>37</sup>	1.51 <sup>34</sup>	
					27	35	43	
29.9	3.85	35.3	39.77	52.4	12.40	21.9	1.94	
June 8.9	4.09 <sup>24</sup>	33.4 <sup>19</sup>	40.00 <sup>23</sup>	49.6 <sup>28</sup>	12.77 <sup>37</sup>	18.5 <sup>34</sup>	2.45 <sup>51</sup>	
18.9	4.35 <sup>26</sup>	31.4 <sup>20</sup>	40.27 <sup>27</sup>	47.0 <sup>26</sup>	13.22 <sup>45</sup>	15.5 <sup>30</sup>	3.04 <sup>59</sup>	
28.8	4.64 <sup>29</sup>	29.3 <sup>21</sup>	40.56 <sup>29</sup>	44.5 <sup>25</sup>	13.74 <sup>52</sup>	12.8 <sup>27</sup>	3.67 <sup>63</sup>	
July 8.8	4.95 <sup>31</sup>	27.3 <sup>20</sup>	40.87 <sup>31</sup>	42.2 <sup>23</sup>	14.32 <sup>58</sup>	10.6 <sup>22</sup>	4.34 <sup>67</sup>	
					62	17	69	
18.8	5.26	25.4	41.20	40.1	14.94	8.9	5.03	
28.7	5.58 <sup>32</sup>	23.6 <sup>18</sup>	41.52 <sup>32</sup>	38.4 <sup>17</sup>	15.58 <sup>64</sup>	7.8 <sup>11</sup>	5.72 <sup>69</sup>	
Aug. 7.7	5.89 <sup>31</sup>	22.0 <sup>16</sup>	41.85 <sup>33</sup>	37.1 <sup>13</sup>	16.23 <sup>65</sup>	7.3 <sup>5</sup>	6.41 <sup>69</sup>	
17.7	6.18 <sup>29</sup>	20.7 <sup>13</sup>	42.16 <sup>31</sup>	36.1 <sup>10</sup>	16.87 <sup>64</sup>	7.3 <sup>0</sup>	7.07 <sup>66</sup>	
27.7	6.46 <sup>28</sup>	19.6 <sup>11</sup>	42.45 <sup>29</sup>	35.6 <sup>5</sup>	17.47 <sup>60</sup>	8.0 <sup>7</sup>	7.69 <sup>62</sup>	
					55	12	50	
Sept. 6.6	6.71	18.8	42.72	35.6	18.02	9.2	8.28	
16.6	6.94 <sup>23</sup>	18.3 <sup>5</sup>	42.96 <sup>24</sup>	36.0 <sup>4</sup>	18.51 <sup>49</sup>	11.0 <sup>18</sup>	8.81 <sup>53</sup>	
26.6	7.13 <sup>19</sup>	18.1 <sup>2</sup>	43.16 <sup>20</sup>	36.8 <sup>8</sup>	18.91 <sup>40</sup>	13.3 <sup>23</sup>	9.27 <sup>46</sup>	
Oct. 6.6	7.30 <sup>17</sup>	18.2 <sup>1</sup>	43.33 <sup>17</sup>	37.9 <sup>11</sup>	19.22 <sup>31</sup>	16.0 <sup>27</sup>	9.67 <sup>40</sup>	
16.5	7.44 <sup>14</sup>	18.6 <sup>4</sup>	43.47 <sup>14</sup>	39.4 <sup>15</sup>	19.43 <sup>21</sup>	18.9 <sup>29</sup>	10.00 <sup>33</sup>	
					10	32	25	
26.5	7.55	19.1	43.57	41.1	19.53	22.1	10.25	
Nov. 5.5	7.62 <sup>7</sup>	19.9 <sup>8</sup>	43.64 <sup>7</sup>	43.0 <sup>19</sup>	19.52 <sup>1</sup>	25.3 <sup>32</sup>	10.42 <sup>17</sup>	
15.4	7.67 <sup>5</sup>	20.8 <sup>9</sup>	43.67 <sup>3</sup>	45.0 <sup>20</sup>	19.40 <sup>12</sup>	28.5 <sup>32</sup>	10.50 <sup>8</sup>	
25.4	7.69 <sup>2</sup>	21.7 <sup>9</sup>	43.67 <sup>0</sup>	47.0 <sup>20</sup>	19.18 <sup>22</sup>	31.4 <sup>29</sup>	10.50 <sup>0</sup>	
Dec. 5.4	7.68 <sup>1</sup>	22.8 <sup>11</sup>	43.64 <sup>3</sup>	48.9 <sup>19</sup>	18.87 <sup>31</sup>	34.1 <sup>27</sup>	10.41 <sup>9</sup>	
					39	23	17	
15.4	7.64	23.8	43.57	50.7	18.48	36.4	10.24	
25.3	7.57 <sup>7</sup>	24.7 <sup>9</sup>	43.48 <sup>9</sup>	52.2 <sup>15</sup>	18.01 <sup>47</sup>	38.2 <sup>18</sup>	10.00 <sup>24</sup>	
35.3	7.49 <sup>8</sup>	25.6 <sup>9</sup>	43.37 <sup>11</sup>	53.5 <sup>13</sup>	17.50 <sup>51</sup>	39.4 <sup>12</sup>	9.67 <sup>33</sup>	
Sec δ, Tan δ	1.002	−0.059	1.096	−0.449	2.796	−2.611	2.562	
Mean Place	3°.092	46''.70	39°.156	68''.11	13°.900	45''.34	2°.701	
D'ψ α Dω α	0.00	0.00	−0.01	+0.02	−0.04	+0.14	+0.04	
Dψ δ, Dω δ	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6	+0.3	

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ξ <sup>2</sup> Ceti. Mag. 4.3		σ Ceti. Mag. 4.8		36 H. Cassiopeiæ. Mag. 5.3		ν Ceti. Mag. 5.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 2 23 s	° ' " + 8 4 "	h m 2 28 s	° ' " - 15 36 "	h m 2 29 s	° ' " + 72 26 "	h m 2 31 s	° ' " + 5 13 "
Jan. 0.3	39.39	55.2	4.72	60.1	57.31	74.9	25.87	30.4
10.3	39.30 <sup>9</sup>	54.6 <sup>6</sup>	4.62 <sup>10</sup>	61.1 <sup>10</sup>	56.83 <sup>48</sup>	76.3 <sup>14</sup>	25.78 <sup>9</sup>	29.7 <sup>7</sup>
20.3	39.19 <sup>11</sup>	54.0 <sup>6</sup>	4.49 <sup>13</sup>	61.9 <sup>8</sup>	56.28 <sup>55</sup>	77.1 <sup>8</sup>	25.68 <sup>10</sup>	29.1 <sup>6</sup>
30.2	39.06 <sup>13</sup>	53.5 <sup>5</sup>	4.35 <sup>14</sup>	62.4 <sup>5</sup>	55.69 <sup>59</sup>	77.4 <sup>3</sup>	25.55 <sup>13</sup>	28.6 <sup>5</sup>
Feb. 9.2	38.93 <sup>13</sup>	53.0 <sup>5</sup>	4.20 <sup>15</sup>	62.7 <sup>3</sup>	55.08 <sup>61</sup>	77.1 <sup>3</sup>	25.42 <sup>13</sup>	28.1 <sup>5</sup>
19.2	38.80 <sup>13</sup>	52.5 <sup>5</sup>	4.06 <sup>14</sup>	62.6 <sup>1</sup>	54.48 <sup>60</sup>	76.2 <sup>9</sup>	25.28 <sup>14</sup>	27.7 <sup>4</sup>
Mar. 1.2	38.67 <sup>13</sup>	52.1 <sup>4</sup>	3.92 <sup>14</sup>	62.3 <sup>3</sup>	53.92 <sup>56</sup>	74.8 <sup>14</sup>	25.15 <sup>13</sup>	27.4 <sup>3</sup>
11.1	38.56 <sup>11</sup>	51.8 <sup>3</sup>	3.79 <sup>13</sup>	61.6 <sup>7</sup>	53.43 <sup>49</sup>	72.9 <sup>19</sup>	25.04 <sup>11</sup>	27.2 <sup>2</sup>
21.1	38.48 <sup>8</sup>	51.7 <sup>1</sup>	3.69 <sup>10</sup>	60.7 <sup>9</sup>	53.03 <sup>40</sup>	70.7 <sup>22</sup>	24.95 <sup>9</sup>	27.2 <sup>0</sup>
31.1	38.42 <sup>6</sup>	51.7 <sup>0</sup>	3.62 <sup>7</sup>	59.5 <sup>12</sup>	52.74 <sup>29</sup>	68.2 <sup>25</sup>	24.89 <sup>6</sup>	27.3 <sup>1</sup>
Apr. 10.1	38.40 <sup>2</sup>	51.8 <sup>1</sup>	3.58 <sup>4</sup>	58.0 <sup>15</sup>	52.58 <sup>16</sup>	65.6 <sup>26</sup>	24.86 <sup>3</sup>	27.6 <sup>3</sup>
20.0	38.43 <sup>3</sup>	52.2 <sup>4</sup>	3.59 <sup>1</sup>	56.3 <sup>17</sup>	52.56 <sup>2</sup>	62.9 <sup>27</sup>	24.88 <sup>2</sup>	28.2 <sup>6</sup>
30.0	38.50 <sup>7</sup>	52.8 <sup>6</sup>	3.64 <sup>5</sup>	54.4 <sup>19</sup>	52.68 <sup>12</sup>	60.2 <sup>27</sup>	24.94 <sup>6</sup>	28.9 <sup>7</sup>
May 10.0	38.62 <sup>12</sup>	53.6 <sup>8</sup>	3.74 <sup>10</sup>	52.2 <sup>22</sup>	52.93 <sup>25</sup>	57.6 <sup>26</sup>	25.05 <sup>11</sup>	29.9 <sup>10</sup>
19.9	38.78 <sup>16</sup>	54.7 <sup>11</sup>	3.89 <sup>15</sup>	49.9 <sup>23</sup>	53.32 <sup>39</sup>	55.3 <sup>23</sup>	25.20 <sup>15</sup>	31.1 <sup>12</sup>
29.9	38.98 <sup>20</sup>	55.9 <sup>12</sup>	4.07 <sup>18</sup>	47.6 <sup>23</sup>	53.84 <sup>52</sup>	53.3 <sup>20</sup>	25.39 <sup>19</sup>	32.4 <sup>13</sup>
June 8.9	39.22 <sup>24</sup>	57.3 <sup>14</sup>	4.07 <sup>23</sup>	45.1 <sup>25</sup>	53.84 <sup>62</sup>	53.3 <sup>16</sup>	25.39 <sup>24</sup>	32.4 <sup>16</sup>
18.9	39.22 <sup>24</sup>	57.3 <sup>14</sup>	4.30 <sup>23</sup>	45.1 <sup>25</sup>	54.46 <sup>62</sup>	51.7 <sup>16</sup>	25.63 <sup>24</sup>	34.0 <sup>16</sup>
28.8	39.49 <sup>27</sup>	58.9 <sup>16</sup>	4.55 <sup>25</sup>	42.7 <sup>24</sup>	55.17 <sup>71</sup>	50.5 <sup>12</sup>	25.89 <sup>26</sup>	35.6 <sup>16</sup>
July 8.8	39.79 <sup>30</sup>	60.6 <sup>17</sup>	4.83 <sup>28</sup>	40.4 <sup>23</sup>	55.95 <sup>78</sup>	49.8 <sup>7</sup>	26.18 <sup>29</sup>	37.4 <sup>18</sup>
18.8	40.10 <sup>31</sup>	62.3 <sup>17</sup>	5.14 <sup>31</sup>	38.1 <sup>23</sup>	56.78 <sup>83</sup>	49.5 <sup>3</sup>	26.48 <sup>30</sup>	39.2 <sup>18</sup>
28.8	40.42 <sup>32</sup>	64.1 <sup>18</sup>	5.45 <sup>31</sup>	36.1 <sup>20</sup>	57.64 <sup>86</sup>	49.5 <sup>2</sup>	26.48 <sup>31</sup>	39.2 <sup>17</sup>
Aug. 7.7	40.74 <sup>32</sup>	65.8 <sup>17</sup>	5.77 <sup>32</sup>	34.3 <sup>18</sup>	58.51 <sup>87</sup>	49.7 <sup>7</sup>	26.79 <sup>32</sup>	40.9 <sup>17</sup>
17.7	41.05 <sup>31</sup>	67.5 <sup>17</sup>	6.08 <sup>31</sup>	32.9 <sup>14</sup>	59.38 <sup>87</sup>	50.4 <sup>7</sup>	27.11 <sup>32</sup>	42.6 <sup>17</sup>
27.7	41.35 <sup>30</sup>	69.0 <sup>15</sup>	6.38 <sup>30</sup>	32.9 <sup>12</sup>	60.22 <sup>84</sup>	51.6 <sup>12</sup>	27.42 <sup>31</sup>	44.3 <sup>17</sup>
Sept. 6.6	41.64 <sup>29</sup>	70.3 <sup>13</sup>	6.67 <sup>29</sup>	31.7 <sup>12</sup>	61.03 <sup>81</sup>	53.2 <sup>16</sup>	27.73 <sup>31</sup>	45.8 <sup>15</sup>
16.6	41.90 <sup>26</sup>	71.5 <sup>12</sup>	7.03 <sup>26</sup>	30.9 <sup>8</sup>	61.78 <sup>75</sup>	55.1 <sup>19</sup>	28.01 <sup>28</sup>	47.0 <sup>12</sup>
26.6	42.14 <sup>24</sup>	72.5 <sup>10</sup>	7.38 <sup>24</sup>	30.6 <sup>3</sup>	62.47 <sup>69</sup>	57.5 <sup>24</sup>	28.28 <sup>27</sup>	48.1 <sup>11</sup>
Oct. 6.6	42.35 <sup>21</sup>	73.2 <sup>7</sup>	7.56 <sup>21</sup>	30.6 <sup>0</sup>	63.08 <sup>61</sup>	57.5 <sup>26</sup>	28.52 <sup>24</sup>	48.1 <sup>8</sup>
16.5	42.53 <sup>18</sup>	73.7 <sup>5</sup>	7.82 <sup>18</sup>	31.0 <sup>4</sup>	64.37 <sup>53</sup>	60.1 <sup>29</sup>	28.73 <sup>21</sup>	48.9 <sup>6</sup>
26.5	42.68 <sup>15</sup>	74.0 <sup>3</sup>	8.17 <sup>15</sup>	31.7 <sup>7</sup>	66.1 <sup>31</sup>	63.0 <sup>29</sup>	28.92 <sup>19</sup>	49.5 <sup>4</sup>
Nov. 5.5	42.80 <sup>12</sup>	74.1 <sup>1</sup>	8.42 <sup>12</sup>	32.7 <sup>10</sup>	68.3 <sup>33</sup>	66.1 <sup>31</sup>	29.07 <sup>15</sup>	49.9 <sup>1</sup>
15.5	42.89 <sup>9</sup>	74.1 <sup>0</sup>	8.67 <sup>9</sup>	34.0 <sup>15</sup>	70.6 <sup>33</sup>	69.3 <sup>32</sup>	29.20 <sup>13</sup>	50.0 <sup>1</sup>
25.4	42.95 <sup>6</sup>	73.8 <sup>3</sup>	8.92 <sup>6</sup>	35.5 <sup>16</sup>	72.9 <sup>33</sup>	72.6 <sup>33</sup>	29.30 <sup>10</sup>	49.9 <sup>3</sup>
Dec. 5.4	42.99 <sup>4</sup>	73.5 <sup>3</sup>	9.17 <sup>4</sup>	37.1 <sup>16</sup>	75.2 <sup>33</sup>	75.9 <sup>33</sup>	29.37 <sup>7</sup>	49.6 <sup>4</sup>
15.4	42.99 <sup>0</sup>	73.1 <sup>4</sup>	9.42 <sup>0</sup>	38.7 <sup>16</sup>	77.5 <sup>31</sup>	79.2 <sup>33</sup>	29.41 <sup>4</sup>	49.2 <sup>5</sup>
25.3	42.96 <sup>3</sup>	72.6 <sup>5</sup>	9.67 <sup>3</sup>	40.3 <sup>16</sup>	79.8 <sup>28</sup>	82.3 <sup>28</sup>	29.41 <sup>0</sup>	48.7 <sup>6</sup>
35.3	42.91 <sup>8</sup>	72.0 <sup>6</sup>	9.92 <sup>8</sup>	41.9 <sup>14</sup>	81.1 <sup>23</sup>	85.1 <sup>26</sup>	29.41 <sup>2</sup>	48.1 <sup>7</sup>
	42.83	71.4 <sup>6</sup>	10.17 <sup>8</sup>	43.3 <sup>11</sup>	83.6 <sup>42</sup>	87.7 <sup>17</sup>	29.39 <sup>5</sup>	47.4 <sup>6</sup>
			10.42 <sup>9</sup>	44.4 <sup>11</sup>	86.1 <sup>42</sup>	89.8 <sup>17</sup>	29.34 <sup>7</sup>	46.8 <sup>7</sup>
							29.27 <sup>7</sup>	46.1 <sup>7</sup>
Inc. & Tan δ	1.010	+0.142	1.038	-0.279	3.317	+3.162	1.004	+0.091
Mean Place	38°.244	46''.74	3°.433	61''.26	55°.347	50''.86	24°.676	22''.74
D <sub>1</sub> & D <sub>2</sub> α	0.00	-0.01	0.00	+0.01	+0.05	-0.17	0.00	-0.01
D <sub>1</sub> & D <sub>2</sub> δ	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Hydri. Mag. 5.3		$\nu$ Arietis. Mag. 5.4		$\delta$ Ceti. Mag. 4.0		$\epsilon$ Hydri. Mag. 4.3	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.
	h m 2 33 s	° ' -79 28 "	h m 2 33 s	° ' +21 35 "	h m 2 35 s	° ' - 0 1 "	h m 2 38 s	° ' -68 3 "
Jan. 0.3	31.91	59.8	60.39	52.6	8.69	69.0	19.67	61.1
10.3	30.75 <sup>116</sup>	60.7 9	60.30 9	52.4 2	8.61 8	69.7 7	19.15 <sup>52</sup>	62.2 1
20.3	29.52 <sup>123</sup>	61.0 3	60.18 12	52.1 3	8.50 <sup>11</sup>	70.4 7	18.60 <sup>55</sup>	62.7
30.2	28.26 <sup>126</sup>	60.6 4	60.05 <sup>13</sup>	51.6 5	8.37 <sup>13</sup>	71.0 6	18.02 <sup>58</sup>	62.7
Feb. 9.2	27.02 <sup>124</sup>	59.7 9	59.90 <sup>15</sup>	51.1 5	8.24 <sup>13</sup>	71.5 5	17.44 <sup>58</sup>	62.0
	121	15	15	7	14	3	57	
19.2	25.81	58.2	59.75	50.4	8.10	71.8	16.87	60.8
Mar. 1.2	24.67 <sup>114</sup>	56.2 20	59.61 <sup>14</sup>	49.7 7	7.97 <sup>13</sup>	71.9 1	16.34 <sup>53</sup>	59.1
11.1	23.64 <sup>103</sup>	53.8 24	59.49 <sup>12</sup>	48.9 8	7.85 <sup>12</sup>	71.9 0	15.85 <sup>49</sup>	56.9
21.1	22.73 <sup>91</sup>	50.9 29	59.39 <sup>10</sup>	48.2 7	7.75 <sup>10</sup>	71.7 2	15.41 <sup>44</sup>	54.2
31.1	21.97 <sup>76</sup>	47.7 32	59.32 7	47.5 7	7.69 6	71.3 4	15.05 <sup>36</sup>	51.2
	60	34	2	6	3	6	27	
Apr. 10.1	21.37	44.3	59.30	46.9	7.66	70.7	14.78	47.9
20.0	20.94 <sup>43</sup>	40.7 36	59.32 2	46.5 4	7.67 1	69.8 9	14.59 <sup>19</sup>	44.4
30.0	20.71 <sup>23</sup>	37.0 37	59.38 6	46.3 2	7.73 6	68.8 <sup>10</sup>	14.51 8	40.7
May 10.0	20.68 3	33.2 38	59.50 <sup>12</sup>	46.3 0	7.83 <sup>10</sup>	67.5 <sup>13</sup>	14.53 2	37.0
19.9	20.84 <sup>16</sup>	29.5 37	59.67 <sup>17</sup>	46.5 2	7.97 <sup>14</sup>	66.0 <sup>15</sup>	14.65 <sup>12</sup>	33.3
	35	35	21	4	19	16	22	
29.9	21.19	26.0	59.88	46.9	8.16	64.4	14.87	29.7
June 8.9	21.73 <sup>54</sup>	22.7 33	60.13 <sup>25</sup>	47.6 7	8.39 <sup>23</sup>	62.6 <sup>18</sup>	15.19 <sup>32</sup>	26.2
18.9	22.43 <sup>70</sup>	19.7 30	60.41 <sup>28</sup>	48.6 <sup>10</sup>	8.64 <sup>25</sup>	60.8 <sup>18</sup>	15.59 <sup>40</sup>	23.1
28.8	23.29 <sup>86</sup>	17.1 26	60.72 <sup>31</sup>	49.7 <sup>11</sup>	8.92 <sup>28</sup>	58.9 <sup>19</sup>	16.07 <sup>48</sup>	20.3
July 8.8	24.27 <sup>98</sup>	14.9 22	61.04 <sup>32</sup>	51.0 <sup>13</sup>	9.22 <sup>30</sup>	57.0 <sup>19</sup>	16.62 <sup>55</sup>	17.9
	108	17	34	15	31	19	59	
18.8	25.35	13.2	61.38	52.5	9.53	55.1	17.21	16.0
28.8	26.49 <sup>114</sup>	12.1 11	61.72 <sup>34</sup>	54.0 <sup>15</sup>	9.85 <sup>32</sup>	53.3 <sup>18</sup>	17.83 <sup>62</sup>	14.6
Aug. 7.7	27.66 <sup>117</sup>	11.6 5	62.05 <sup>33</sup>	55.6 <sup>16</sup>	10.16 <sup>31</sup>	51.7 <sup>16</sup>	18.47 <sup>64</sup>	13.8
17.7	28.83 <sup>117</sup>	11.7 1	62.37 <sup>32</sup>	57.2 <sup>16</sup>	10.46 <sup>30</sup>	50.3 <sup>14</sup>	19.10 <sup>63</sup>	13.6
27.7	29.95 <sup>112</sup>	12.4 7	62.68 <sup>31</sup>	58.8 <sup>16</sup>	10.74 <sup>28</sup>	49.2 <sup>11</sup>	19.71 <sup>61</sup>	14.1
	104	13	28	16	26	9	57	
Sept. 6.6	30.99	13.7	62.96	60.4	11.00	48.3	20.28	15.2
16.6	31.92 <sup>93</sup>	15.5 18	63.22 <sup>26</sup>	61.8 <sup>14</sup>	11.24 <sup>24</sup>	47.7 6	20.78 <sup>50</sup>	16.8
26.6	32.70 <sup>78</sup>	17.8 23	63.46 <sup>24</sup>	63.1 <sup>13</sup>	11.46 <sup>22</sup>	47.3 4	21.21 <sup>43</sup>	18.9
Oct. 6.6	33.30 <sup>60</sup>	20.5 27	63.66 <sup>20</sup>	64.3 <sup>12</sup>	11.65 <sup>19</sup>	47.3 0	21.56 <sup>35</sup>	21.5
16.5	33.69 <sup>39</sup>	23.6 31	63.84 <sup>18</sup>	65.3 <sup>10</sup>	11.81 <sup>16</sup>	47.5 2	21.81 <sup>25</sup>	24.4
	19	32	14	9	12	3	15	
26.5	33.88	26.8	63.98	66.2	11.93	47.8	21.96	27.5
Nov. 5.5	33.84 4	30.0 32	64.09 <sup>11</sup>	67.0 8	12.03 <sup>10</sup>	48.4 6	22.00 4	30.8
15.5	33.57 <sup>27</sup>	33.3 33	64.17 8	67.6 6	12.10 7	49.2 8	21.93 7	34.0
25.4	33.10 <sup>47</sup>	36.3 30	64.22 5	68.0 4	12.14 4	50.0 8	21.76 <sup>17</sup>	37.1
Dec. 5.4	32.42 <sup>68</sup>	39.0 27	64.24 2	68.3 3	12.15 1	50.9 9	21.49 <sup>27</sup>	40.0
	85	23	2	2	2	9	35	
15.4	31.57	41.3	64.22	68.5	12.13	51.8	21.14	42.5
25.3	30.57 <sup>100</sup>	43.1 18	64.17 5	68.5 0	12.08 5	52.7 9	20.71 <sup>43</sup>	44.5
35.3	29.46 <sup>111</sup>	44.4 13	64.10 7	68.4 1	12.00 8	53.5 8	20.22 <sup>49</sup>	46.0
Sec $\delta$ , Tan $\delta$	5.475	-5.383	1.076	+0.396	1.000	-0.001	2.744	-2.5
Mean Place	26°.416	49''.47	59°.203	39''.96	7°.461	75''.01	16°.634	51''.61
$D'_{\psi} \alpha$ , $D_{\omega} \alpha$	-0.09	+0.28	+0.01	-0.02	0.00	0.00	-0.04	+0.1
$D_{\psi} \delta$ , $D_{\omega} \delta$	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\theta$ Persei. Mag. 4.2		$\gamma$ Ceti seq. Mag. 3.7		$\pi$ Ceti. Mag. 4.4		$\mu$ Ceti. Mag. 4.4	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 2 38 s	° ' " + 48 52 "	h m 2 38 s	° ' " + 2 52 "	h m 2 40 s	° ' " - 14 12 "	h m 2 40 s	° ' " + 9 45 "
Jan. 0.3	24.55 <sup>16</sup>	30.8 <sup>7</sup>	54.91 <sup>9</sup>	48.4 <sup>7</sup>	5.90 <sup>10</sup>	63.3 <sup>11</sup>	21.91 <sup>9</sup>	30.6 <sup>6</sup>
10.3	24.39 <sup>19</sup>	31.5 <sup>4</sup>	54.82 <sup>11</sup>	47.7 <sup>6</sup>	5.80 <sup>12</sup>	64.4 <sup>8</sup>	21.82 <sup>10</sup>	30.0 <sup>5</sup>
20.3	24.20 <sup>22</sup>	31.9 <sup>1</sup>	54.71 <sup>12</sup>	47.1 <sup>6</sup>	5.68 <sup>14</sup>	65.2 <sup>6</sup>	21.72 <sup>12</sup>	29.5 <sup>5</sup>
30.3	23.98 <sup>23</sup>	31.8 <sup>5</sup>	54.59 <sup>14</sup>	46.5 <sup>5</sup>	5.54 <sup>15</sup>	65.8 <sup>3</sup>	21.60 <sup>14</sup>	29.0 <sup>5</sup>
Feb. 9.2	23.75 <sup>24</sup>	31.3 <sup>8</sup>	54.45 <sup>14</sup>	46.0 <sup>4</sup>	5.39 <sup>15</sup>	66.1 <sup>0</sup>	21.46 <sup>14</sup>	28.5 <sup>5</sup>
19.2	23.51 <sup>22</sup>	30.5 <sup>12</sup>	54.31 <sup>13</sup>	45.6 <sup>2</sup>	5.24 <sup>15</sup>	66.1 <sup>2</sup>	21.32 <sup>13</sup>	28.0 <sup>4</sup>
Mar. 1.2	23.29 <sup>20</sup>	29.3 <sup>14</sup>	54.18 <sup>12</sup>	45.4 <sup>1</sup>	5.09 <sup>13</sup>	65.9 <sup>5</sup>	21.19 <sup>12</sup>	27.6 <sup>4</sup>
11.1	23.09 <sup>16</sup>	27.9 <sup>17</sup>	54.06 <sup>10</sup>	45.3 <sup>1</sup>	4.96 <sup>11</sup>	65.4 <sup>9</sup>	21.07 <sup>10</sup>	27.2 <sup>2</sup>
21.1	22.93 <sup>11</sup>	26.2 <sup>18</sup>	53.96 <sup>7</sup>	45.4 <sup>2</sup>	4.85 <sup>8</sup>	64.5 <sup>11</sup>	20.97 <sup>7</sup>	27.0 <sup>1</sup>
31.1	22.82 <sup>5</sup>	24.4 <sup>19</sup>	53.89 <sup>3</sup>	45.6 <sup>5</sup>	4.77 <sup>4</sup>	63.4 <sup>13</sup>	20.90 <sup>3</sup>	26.9 <sup>1</sup>
Apr. 10.1	22.77 <sup>1</sup>	22.5 <sup>18</sup>	53.86 <sup>1</sup>	46.1 <sup>6</sup>	4.73 <sup>0</sup>	62.1 <sup>17</sup>	20.87 <sup>1</sup>	27.0 <sup>2</sup>
20.0	22.78 <sup>8</sup>	20.7 <sup>18</sup>	53.87 <sup>6</sup>	46.7 <sup>9</sup>	4.73 <sup>4</sup>	60.4 <sup>18</sup>	20.88 <sup>6</sup>	27.2 <sup>5</sup>
30.0	22.86 <sup>14</sup>	18.9 <sup>16</sup>	53.93 <sup>10</sup>	47.6 <sup>11</sup>	4.77 <sup>9</sup>	58.6 <sup>20</sup>	20.94 <sup>10</sup>	27.7 <sup>7</sup>
May 10.0	23.00 <sup>21</sup>	17.3 <sup>13</sup>	54.03 <sup>14</sup>	48.7 <sup>13</sup>	4.86 <sup>13</sup>	56.6 <sup>22</sup>	21.04 <sup>15</sup>	28.4 <sup>9</sup>
20.0	23.21 <sup>27</sup>	16.0 <sup>10</sup>	54.17 <sup>19</sup>	50.0 <sup>14</sup>	4.99 <sup>17</sup>	54.4 <sup>23</sup>	21.19 <sup>19</sup>	29.3 <sup>11</sup>
29.9	23.48 <sup>33</sup>	15.0 <sup>7</sup>	54.36 <sup>22</sup>	51.4 <sup>17</sup>	5.16 <sup>22</sup>	52.1 <sup>24</sup>	21.38 <sup>23</sup>	30.4 <sup>13</sup>
June 8.9	23.81 <sup>37</sup>	14.3 <sup>4</sup>	54.58 <sup>25</sup>	53.1 <sup>17</sup>	5.38 <sup>25</sup>	49.7 <sup>24</sup>	21.61 <sup>26</sup>	31.7 <sup>14</sup>
18.9	24.18 <sup>40</sup>	13.9 <sup>1</sup>	54.83 <sup>28</sup>	54.8 <sup>18</sup>	5.63 <sup>27</sup>	47.3 <sup>23</sup>	21.87 <sup>29</sup>	33.1 <sup>15</sup>
28.8	24.58 <sup>43</sup>	14.0 <sup>3</sup>	55.11 <sup>30</sup>	56.6 <sup>18</sup>	5.90 <sup>30</sup>	45.0 <sup>22</sup>	22.16 <sup>30</sup>	34.6 <sup>17</sup>
July 8.8	25.01 <sup>44</sup>	14.3 <sup>7</sup>	55.41 <sup>31</sup>	58.4 <sup>18</sup>	6.20 <sup>31</sup>	42.8 <sup>21</sup>	22.46 <sup>32</sup>	36.3 <sup>17</sup>
18.8	25.45 <sup>45</sup>	15.0 <sup>11</sup>	55.72 <sup>32</sup>	60.2 <sup>17</sup>	6.51 <sup>31</sup>	40.7 <sup>18</sup>	22.78 <sup>32</sup>	38.0 <sup>16</sup>
28.8	25.90 <sup>45</sup>	16.1 <sup>13</sup>	56.04 <sup>31</sup>	61.9 <sup>16</sup>	6.82 <sup>31</sup>	38.9 <sup>15</sup>	23.10 <sup>32</sup>	39.6 <sup>16</sup>
Aug. 7.7	26.35 <sup>44</sup>	17.4 <sup>16</sup>	56.35 <sup>30</sup>	63.5 <sup>14</sup>	7.13 <sup>31</sup>	37.4 <sup>12</sup>	23.42 <sup>31</sup>	41.2 <sup>15</sup>
17.7	26.79 <sup>41</sup>	19.0 <sup>19</sup>	56.65 <sup>29</sup>	64.9 <sup>12</sup>	7.44 <sup>29</sup>	36.2 <sup>8</sup>	23.73 <sup>29</sup>	42.7 <sup>13</sup>
27.7	27.20 <sup>39</sup>	20.9 <sup>20</sup>	56.94 <sup>27</sup>	66.1 <sup>10</sup>	7.73 <sup>26</sup>	35.4 <sup>5</sup>	24.02 <sup>27</sup>	44.0 <sup>12</sup>
Sept. 6.7	27.59 <sup>36</sup>	22.9 <sup>22</sup>	57.21 <sup>24</sup>	67.1 <sup>7</sup>	7.99 <sup>25</sup>	34.9 <sup>1</sup>	24.29 <sup>25</sup>	45.2 <sup>10</sup>
16.6	27.95 <sup>32</sup>	25.1 <sup>23</sup>	57.45 <sup>22</sup>	67.8 <sup>5</sup>	8.24 <sup>22</sup>	34.8 <sup>3</sup>	24.54 <sup>23</sup>	46.2 <sup>8</sup>
26.6	28.27 <sup>28</sup>	27.4 <sup>24</sup>	57.67 <sup>19</sup>	68.3 <sup>2</sup>	8.46 <sup>19</sup>	35.1 <sup>7</sup>	24.77 <sup>20</sup>	47.0 <sup>5</sup>
Oct. 6.6	28.55 <sup>24</sup>	29.8 <sup>24</sup>	57.86 <sup>16</sup>	68.5 <sup>0</sup>	8.65 <sup>15</sup>	35.8 <sup>10</sup>	24.97 <sup>17</sup>	47.5 <sup>4</sup>
16.5	28.79 <sup>20</sup>	32.2 <sup>23</sup>	58.02 <sup>14</sup>	68.5 <sup>3</sup>	8.80 <sup>13</sup>	36.8 <sup>12</sup>	25.14 <sup>14</sup>	47.9 <sup>1</sup>
26.5	28.99 <sup>15</sup>	34.5 <sup>23</sup>	58.16 <sup>10</sup>	68.2 <sup>4</sup>	8.93 <sup>9</sup>	38.0 <sup>14</sup>	25.28 <sup>11</sup>	48.0 <sup>0</sup>
Nov. 5.5	29.14 <sup>11</sup>	36.8 <sup>22</sup>	58.26 <sup>8</sup>	67.8 <sup>6</sup>	9.02 <sup>7</sup>	39.4 <sup>16</sup>	25.39 <sup>8</sup>	48.0 <sup>1</sup>
15.5	29.25 <sup>5</sup>	39.0 <sup>20</sup>	58.34 <sup>4</sup>	67.2 <sup>6</sup>	9.09 <sup>3</sup>	41.0 <sup>16</sup>	25.47 <sup>5</sup>	47.9 <sup>3</sup>
25.4	29.30 <sup>1</sup>	41.0 <sup>18</sup>	58.38 <sup>1</sup>	66.6 <sup>8</sup>	9.12 <sup>0</sup>	42.6 <sup>16</sup>	25.52 <sup>2</sup>	47.6 <sup>4</sup>
Dec. 5.4	29.31 <sup>4</sup>	42.8 <sup>16</sup>	58.39 <sup>2</sup>	65.8 <sup>8</sup>	9.12 <sup>3</sup>	44.2 <sup>15</sup>	25.54 <sup>1</sup>	47.2 <sup>4</sup>
15.4	29.27 <sup>9</sup>	44.4 <sup>13</sup>	58.37 <sup>4</sup>	65.0 <sup>8</sup>	9.09 <sup>6</sup>	45.7 <sup>14</sup>	25.53 <sup>4</sup>	46.8 <sup>5</sup>
25.4	29.18 <sup>13</sup>	45.7 <sup>9</sup>	58.33 <sup>7</sup>	64.2 <sup>7</sup>	9.03 <sup>9</sup>	47.1 <sup>12</sup>	25.49 <sup>7</sup>	46.3 <sup>6</sup>
35.3	29.05	46.6	58.26	63.5	8.94	48.3	25.42	45.7
Sec $\delta$ , Tan $\delta$	1.520	+1.145	1.001	+0.050	1.032	-0.253	1.015	+0.172
Mean Place	23°.193	11''.05	53°.664	41''.43	4°.561	65''.18	20°.674	21''.47
$D_{\delta} \alpha$ , $D_{\alpha} \alpha$	+0.02	-0.06	0.00	0.00	0.00	+0.01	0.00	-0.01
$D_{\delta} \delta$ , $D_{\alpha} \delta$	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6	+0.3	+0.6

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	η Persei. Mag. 3.9		41 Arietis. Mag. 3.7		β Fornacis. Mag. 4.5		σ Arietis. Mag. 5.5	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 2 44 s	° ' " + 55 32 "	h m 2 44 s	° ' " + 26 54 "	h m 2 45 s	° ' " − 32 45 "	h m 2 46 s	° ' " + 14 43 "
Jan. 0.3	30.76	57.9	59.85	53.4	33.55	47.9	49.08	67.1
10.3	30.57 <sup>19</sup>	58.9 <sup>10</sup>	59.76 <sup>9</sup>	53.4 <sup>0</sup>	33.41 <sup>14</sup>	49.2 <sup>13</sup>	49.00 <sup>8</sup>	66.7 <sup>4</sup>
20.3	30.33 <sup>24</sup>	59.5 <sup>6</sup>	59.64 <sup>12</sup>	53.2 <sup>2</sup>	33.25 <sup>16</sup>	50.1 <sup>9</sup>	48.89 <sup>11</sup>	66.3 <sup>4</sup>
30.3	30.07 <sup>26</sup>	59.6 <sup>1</sup>	59.50 <sup>14</sup>	52.8 <sup>4</sup>	33.07 <sup>18</sup>	50.7 <sup>6</sup>	48.76 <sup>13</sup>	65.8 <sup>5</sup>
Feb. 9.2	29.78 <sup>29</sup>	59.3 <sup>3</sup>	59.34 <sup>16</sup>	52.3 <sup>5</sup>	32.87 <sup>20</sup>	50.8 <sup>1</sup>	48.62 <sup>14</sup>	65.3 <sup>5</sup>
19.2	29.49	58.5	59.18	51.7	32.68	50.4	48.48	64.7
Mar. 1.2	29.22 <sup>27</sup>	57.3 <sup>12</sup>	59.03 <sup>15</sup>	50.9 <sup>8</sup>	32.49 <sup>19</sup>	49.7 <sup>7</sup>	48.34 <sup>14</sup>	64.2 <sup>5</sup>
11.1	28.97 <sup>25</sup>	55.8 <sup>15</sup>	58.89 <sup>14</sup>	50.0 <sup>9</sup>	32.32 <sup>17</sup>	48.5 <sup>12</sup>	48.21 <sup>13</sup>	63.7 <sup>5</sup>
21.1	28.77 <sup>20</sup>	54.0 <sup>18</sup>	58.78 <sup>11</sup>	49.1 <sup>9</sup>	32.17 <sup>15</sup>	46.9 <sup>16</sup>	48.10 <sup>11</sup>	63.3 <sup>4</sup>
31.1	28.62 <sup>15</sup>	52.0 <sup>20</sup>	58.70 <sup>8</sup>	48.2 <sup>9</sup>	32.06 <sup>11</sup>	45.0 <sup>19</sup>	48.03 <sup>7</sup>	62.9 <sup>4</sup>
Apr. 10.1	28.54	49.9	58.66	47.3	31.98	42.8	48.00	62.7
20.0	28.53 <sup>1</sup>	47.8 <sup>21</sup>	58.67 <sup>1</sup>	46.6 <sup>7</sup>	31.95 <sup>3</sup>	40.3 <sup>25</sup>	48.00 <sup>0</sup>	62.7 <sup>0</sup>
30.0	28.60 <sup>7</sup>	45.7 <sup>21</sup>	58.73 <sup>6</sup>	46.0 <sup>6</sup>	31.96 <sup>1</sup>	37.6 <sup>27</sup>	48.05 <sup>5</sup>	62.9 <sup>2</sup>
May 10.0	28.75 <sup>15</sup>	43.8 <sup>19</sup>	58.84 <sup>11</sup>	45.7 <sup>3</sup>	32.03 <sup>7</sup>	34.7 <sup>29</sup>	48.15 <sup>10</sup>	63.2 <sup>3</sup>
20.0	28.98 <sup>23</sup>	42.2 <sup>16</sup>	59.00 <sup>16</sup>	45.5 <sup>2</sup>	32.15 <sup>12</sup>	31.7 <sup>30</sup>	48.30 <sup>15</sup>	63.8 <sup>6</sup>
29.9	29.27	40.8	59.21	45.6	32.32	28.7	48.49	64.6
June 8.9	29.63 <sup>36</sup>	39.7 <sup>11</sup>	59.46 <sup>25</sup>	46.0 <sup>4</sup>	32.53 <sup>21</sup>	25.7 <sup>30</sup>	48.72 <sup>23</sup>	65.6 <sup>10</sup>
18.9	30.04 <sup>41</sup>	39.0 <sup>7</sup>	59.75 <sup>29</sup>	46.6 <sup>6</sup>	32.78 <sup>25</sup>	22.8 <sup>29</sup>	48.98 <sup>26</sup>	66.8 <sup>12</sup>
28.8	30.49 <sup>45</sup>	38.7 <sup>3</sup>	60.06 <sup>31</sup>	47.5 <sup>9</sup>	33.06 <sup>28</sup>	20.0 <sup>28</sup>	49.27 <sup>29</sup>	68.1 <sup>13</sup>
July 8.8	30.97 <sup>48</sup>	38.8 <sup>1</sup>	60.39 <sup>33</sup>	48.6 <sup>11</sup>	33.37 <sup>31</sup>	17.5 <sup>25</sup>	49.58 <sup>31</sup>	69.6 <sup>15</sup>
18.8	31.47	39.2	60.74	49.8	33.70	15.3	49.90	71.1
28.8	31.98 <sup>51</sup>	40.1 <sup>9</sup>	61.09 <sup>35</sup>	51.2 <sup>14</sup>	34.03 <sup>33</sup>	13.5 <sup>18</sup>	50.23 <sup>33</sup>	72.7 <sup>16</sup>
Aug. 7.7	32.49 <sup>51</sup>	41.3 <sup>12</sup>	61.44 <sup>35</sup>	52.7 <sup>15</sup>	34.37 <sup>34</sup>	12.1 <sup>14</sup>	50.55 <sup>32</sup>	74.2 <sup>15</sup>
17.7	32.98 <sup>49</sup>	42.8 <sup>15</sup>	61.78 <sup>34</sup>	54.2 <sup>15</sup>	34.70 <sup>33</sup>	11.2 <sup>9</sup>	50.87 <sup>32</sup>	75.7 <sup>15</sup>
27.7	33.46 <sup>48</sup>	44.6 <sup>18</sup>	62.10 <sup>32</sup>	55.8 <sup>16</sup>	35.02 <sup>32</sup>	10.8 <sup>4</sup>	51.17 <sup>30</sup>	77.1 <sup>14</sup>
Sept. 6.7	33.90	46.6	62.40	57.4	35.32	10.9	51.45	78.4
16.6	34.32 <sup>42</sup>	48.9 <sup>23</sup>	62.68 <sup>28</sup>	58.9 <sup>15</sup>	35.59 <sup>27</sup>	11.5 <sup>6</sup>	51.71 <sup>26</sup>	79.6 <sup>12</sup>
26.6	34.69 <sup>37</sup>	51.3 <sup>24</sup>	62.93 <sup>25</sup>	60.4 <sup>15</sup>	35.83 <sup>24</sup>	12.5 <sup>10</sup>	51.94 <sup>23</sup>	80.5 <sup>9</sup>
Oct. 6.6	35.02 <sup>33</sup>	53.8 <sup>25</sup>	63.15 <sup>22</sup>	61.8 <sup>14</sup>	36.03 <sup>20</sup>	14.0 <sup>15</sup>	52.15 <sup>21</sup>	81.3 <sup>8</sup>
16.5	35.30 <sup>28</sup>	56.4 <sup>26</sup>	63.35 <sup>20</sup>	63.1 <sup>13</sup>	36.20 <sup>17</sup>	15.8 <sup>18</sup>	52.33 <sup>18</sup>	81.9 <sup>6</sup>
26.5	35.53	59.1	63.51	64.3	36.33	18.0	52.48	82.3
Nov. 5.5	35.71 <sup>18</sup>	61.7 <sup>26</sup>	63.64 <sup>13</sup>	65.3 <sup>10</sup>	36.42 <sup>9</sup>	20.3 <sup>23</sup>	52.60 <sup>12</sup>	82.6 <sup>3</sup>
15.5	35.84 <sup>13</sup>	64.2 <sup>25</sup>	63.74 <sup>10</sup>	66.2 <sup>9</sup>	36.47 <sup>5</sup>	22.7 <sup>24</sup>	52.69 <sup>9</sup>	82.8 <sup>2</sup>
25.4	35.90 <sup>6</sup>	66.5 <sup>23</sup>	63.80 <sup>6</sup>	66.9 <sup>7</sup>	36.48 <sup>1</sup>	25.2 <sup>25</sup>	52.75 <sup>6</sup>	82.8 <sup>0</sup>
Dec. 5.4	35.91 <sup>1</sup>	68.7 <sup>22</sup>	63.82 <sup>2</sup>	67.5 <sup>6</sup>	36.45 <sup>3</sup>	27.5 <sup>23</sup>	52.78 <sup>3</sup>	82.7 <sup>1</sup>
15.4	35.85	70.6	63.82	68.0	36.39	29.7	52.77	82.5
25.4	35.74 <sup>11</sup>	72.2 <sup>16</sup>	63.78 <sup>4</sup>	68.3 <sup>3</sup>	36.30 <sup>9</sup>	31.6 <sup>19</sup>	52.73 <sup>4</sup>	82.2 <sup>3</sup>
35.3	35.58 <sup>16</sup>	73.5 <sup>13</sup>	63.70 <sup>8</sup>	68.4 <sup>1</sup>	36.17 <sup>13</sup>	33.2 <sup>16</sup>	52.67 <sup>6</sup>	81.9 <sup>3</sup>
Sec δ, Tan δ	1.768	+1.458	1.121	+0.508	1.189	−0.643	1.034	+0.263
Mean Place	29°.228	36''.93	58°.582	39''.24	31°.992	44''.94	47°.812	56''.45
D'ψ α, Dω α	+0.03	−0.07	+0.01	−0.03	−0.01	+0.03	0.00	−0.01
Dψ δ, Dω δ	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	τ <sup>2</sup> Eridani. Mag. 4.8		τ Persel. Mag. 4.1		η Eridani. Mag. 4.0		ε Arietis (mean). Mag. 4.6	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 2 47 s	° ' " — 21 20 "	h m 2 48 s	° ' " + 52 24 "	h m 2 52 s	° ' " — 9 13 "	h m 2 54 s	° ' " + 21 0 "
Jan. 0.3	12.32	73.4	14.85	76.0	17.83	65.4	22.20	16.1
10.3	12.21 <sup>11</sup>	74.6 <sup>12</sup>	14.68 <sup>17</sup>	76.9 <sup>9</sup>	17.74 <sup>9</sup>	66.4 <sup>10</sup>	22.12 <sup>8</sup>	15.9 <sup>2</sup>
20.3	12.08 <sup>13</sup>	75.5 <sup>9</sup>	14.47 <sup>21</sup>	77.4 <sup>5</sup>	17.63 <sup>11</sup>	67.3 <sup>9</sup>	22.01 <sup>11</sup>	15.7 <sup>2</sup>
30.3	11.93 <sup>15</sup>	76.1 <sup>6</sup>	14.23 <sup>24</sup>	77.5 <sup>1</sup>	17.50 <sup>13</sup>	67.9 <sup>6</sup>	21.88 <sup>13</sup>	15.3 <sup>4</sup>
Feb. 9.2	11.77 <sup>16</sup>	76.4 <sup>3</sup>	13.97 <sup>26</sup>	77.2 <sup>3</sup>	17.36 <sup>14</sup>	68.3 <sup>4</sup>	21.73 <sup>15</sup>	14.8 <sup>5</sup>
	17	1	26	8	15	2	15	6
19.2	11.60	76.3	13.71	76.4	17.21	68.5	21.58	14.2
Mar. 1.2	11.44 <sup>16</sup>	75.9 <sup>4</sup>	13.46 <sup>25</sup>	75.3 <sup>11</sup>	17.06 <sup>15</sup>	68.4 <sup>1</sup>	21.43 <sup>15</sup>	13.5 <sup>7</sup>
11.2	11.30 <sup>14</sup>	75.1 <sup>8</sup>	13.23 <sup>23</sup>	73.9 <sup>14</sup>	16.93 <sup>13</sup>	68.1 <sup>3</sup>	21.29 <sup>14</sup>	12.9 <sup>6</sup>
21.1	11.17 <sup>13</sup>	74.0 <sup>11</sup>	13.04 <sup>19</sup>	72.2 <sup>17</sup>	16.82 <sup>11</sup>	67.6 <sup>5</sup>	21.18 <sup>11</sup>	12.2 <sup>7</sup>
31.1	11.08 <sup>9</sup>	72.6 <sup>14</sup>	12.91 <sup>13</sup>	70.3 <sup>19</sup>	16.73 <sup>9</sup>	66.7 <sup>9</sup>	21.10 <sup>8</sup>	11.6 <sup>6</sup>
	6	16	8	19	5	10	5	5
Apr. 10.1	11.02	71.0	12.83	68.4	16.68	65.7	21.05	11.1
20.0	11.00 <sup>2</sup>	69.0 <sup>20</sup>	12.82 <sup>1</sup>	66.4 <sup>20</sup>	16.67 <sup>1</sup>	64.4 <sup>13</sup>	21.05 <sup>0</sup>	10.7 <sup>4</sup>
30.0	11.03 <sup>3</sup>	66.8 <sup>22</sup>	12.88 <sup>6</sup>	64.5 <sup>19</sup>	16.70 <sup>3</sup>	62.8 <sup>16</sup>	21.10 <sup>5</sup>	10.5 <sup>2</sup>
May 10.0	11.10 <sup>7</sup>	64.4 <sup>24</sup>	13.02 <sup>14</sup>	62.7 <sup>18</sup>	16.78 <sup>8</sup>	61.1 <sup>17</sup>	21.20 <sup>10</sup>	10.5 <sup>0</sup>
20.0	11.22 <sup>12</sup>	61.9 <sup>25</sup>	13.23 <sup>21</sup>	61.2 <sup>15</sup>	16.90 <sup>12</sup>	59.2 <sup>19</sup>	21.34 <sup>14</sup>	10.7 <sup>2</sup>
	17	26	27	13	17	21	19	4
29.9	11.39	59.3	13.50	59.9	17.07	57.1	21.53	11.1
June 8.9	11.60 <sup>21</sup>	56.7 <sup>26</sup>	13.83 <sup>33</sup>	58.9 <sup>10</sup>	17.28 <sup>21</sup>	55.0 <sup>21</sup>	21.76 <sup>23</sup>	11.7 <sup>6</sup>
18.9	11.84 <sup>24</sup>	54.0 <sup>27</sup>	14.22 <sup>39</sup>	58.3 <sup>6</sup>	17.52 <sup>24</sup>	52.8 <sup>22</sup>	22.03 <sup>27</sup>	12.5 <sup>8</sup>
28.9	12.11 <sup>27</sup>	51.5 <sup>25</sup>	14.64 <sup>42</sup>	58.1 <sup>2</sup>	17.78 <sup>26</sup>	50.6 <sup>22</sup>	22.33 <sup>30</sup>	13.6 <sup>11</sup>
July 8.8	12.41 <sup>30</sup>	49.2 <sup>23</sup>	15.09 <sup>45</sup>	58.3 <sup>2</sup>	18.07 <sup>29</sup>	48.5 <sup>21</sup>	22.64 <sup>31</sup>	14.8 <sup>12</sup>
	31	21	47	5	31	20	33	13
18.8	12.72	47.1	15.56	58.8	18.38	46.5	22.97	16.1
28.8	13.04 <sup>32</sup>	45.2 <sup>19</sup>	16.04 <sup>48</sup>	59.6 <sup>8</sup>	18.69 <sup>31</sup>	44.7 <sup>18</sup>	23.31 <sup>34</sup>	17.5 <sup>14</sup>
Aug. 7.7	13.35 <sup>31</sup>	43.7 <sup>15</sup>	16.52 <sup>48</sup>	60.8 <sup>12</sup>	19.00 <sup>31</sup>	43.2 <sup>15</sup>	23.64 <sup>33</sup>	19.0 <sup>15</sup>
17.7	13.66 <sup>31</sup>	42.6 <sup>11</sup>	16.98 <sup>46</sup>	62.3 <sup>15</sup>	19.30 <sup>30</sup>	41.9 <sup>13</sup>	23.97 <sup>33</sup>	20.5 <sup>15</sup>
27.7	13.96 <sup>30</sup>	41.9 <sup>7</sup>	17.43 <sup>45</sup>	64.0 <sup>17</sup>	19.59 <sup>29</sup>	40.9 <sup>10</sup>	24.28 <sup>31</sup>	21.9 <sup>14</sup>
	28	2	42	20	27	6	30	14
Sept. 6.7	14.24	41.7	17.85	66.0	19.86	40.3	24.58	23.3
16.6	14.49 <sup>25</sup>	41.9 <sup>2</sup>	18.24 <sup>39</sup>	68.2 <sup>22</sup>	20.12 <sup>26</sup>	40.1 <sup>2</sup>	24.85 <sup>27</sup>	24.6 <sup>13</sup>
26.6	14.72 <sup>23</sup>	42.5 <sup>6</sup>	18.60 <sup>36</sup>	70.5 <sup>23</sup>	20.34 <sup>22</sup>	40.2 <sup>1</sup>	25.10 <sup>25</sup>	25.8 <sup>12</sup>
Oct. 6.6	14.92 <sup>20</sup>	43.5 <sup>10</sup>	18.91 <sup>31</sup>	72.9 <sup>24</sup>	20.54 <sup>20</sup>	40.6 <sup>4</sup>	25.32 <sup>22</sup>	26.9 <sup>11</sup>
16.5	15.08 <sup>16</sup>	44.8 <sup>13</sup>	19.18 <sup>27</sup>	75.3 <sup>24</sup>	20.71 <sup>17</sup>	41.3 <sup>7</sup>	25.52 <sup>20</sup>	27.8 <sup>9</sup>
	13	16	23	25	14	10	16	8
26.5	15.21 <sup>1</sup>	46.4	19.41	77.8	20.85	42.3	25.68	28.6
Nov. 5.5	15.31 <sup>10</sup>	48.2 <sup>18</sup>	19.58 <sup>17</sup>	80.2 <sup>24</sup>	20.96 <sup>11</sup>	43.5 <sup>12</sup>	25.82 <sup>14</sup>	29.2 <sup>6</sup>
15.5	15.38 <sup>7</sup>	50.1 <sup>19</sup>	19.71 <sup>13</sup>	82.6 <sup>24</sup>	21.04 <sup>8</sup>	44.8 <sup>13</sup>	25.92 <sup>10</sup>	29.7 <sup>5</sup>
25.4	15.41 <sup>3</sup>	52.1 <sup>20</sup>	19.78 <sup>7</sup>	84.8 <sup>22</sup>	21.09 <sup>5</sup>	46.2 <sup>14</sup>	25.99 <sup>7</sup>	30.1 <sup>4</sup>
Dec. 5.4	15.40 <sup>1</sup>	54.1 <sup>20</sup>	19.80 <sup>2</sup>	86.8 <sup>20</sup>	21.10 <sup>1</sup>	47.6 <sup>14</sup>	26.02 <sup>3</sup>	30.4 <sup>3</sup>
	4	18	4	18	1	14	1	1
15.4	15.36 <sup>6</sup>	55.9	19.76	88.6	21.09	49.0	26.03	30.5 <sup>0</sup>
25.4	15.30 <sup>10</sup>	57.6 <sup>17</sup>	19.67 <sup>9</sup>	90.1 <sup>15</sup>	21.04 <sup>5</sup>	50.3 <sup>13</sup>	26.00 <sup>3</sup>	30.5 <sup>0</sup>
35.3	15.20 <sup>10</sup>	59.0 <sup>14</sup>	19.53 <sup>14</sup>	91.2 <sup>11</sup>	20.97 <sup>7</sup>	51.4 <sup>11</sup>	25.93 <sup>7</sup>	30.5 <sup>0</sup>
Sec δ, Tan δ	1.074	—0.391	1.640	+1.299	1.013	—0.163	1.071	+0.384
Mean Place	10 <sup>h</sup> .893	73 <sup>m</sup> .46	13 <sup>h</sup> .337	55 <sup>m</sup> .69	16 <sup>h</sup> .469	68 <sup>m</sup> .95	20 <sup>h</sup> .884	3 <sup>m</sup> .66
D <sup>α</sup> α, D <sub>α</sub> α	—0.01	+0.02	+0.02	—0.06	0.00	+0.01	+0.01	—0.02
D <sup>δ</sup> δ, D <sub>δ</sub> δ	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	47 H. Cephei. Mag. 5.7		θ Eridani. Mag. 3.4		α Ceti. Mag. 2.8		γ Persel Mag. 3.	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	
	h m 2 54 s	° ' " +79 5 "	h m 2 55 s	° ' " -40 38 "	h m 2 57 s	° ' " + 3 45 "	h m 2 58 s	
Jan. 0.3	47.60	27.4	4.15	45.6	51.39	32.3	39.53	
10.3	46.85 <sup>75</sup>	29.2 <sup>18</sup>	3.98 <sup>17</sup>	47.1 <sup>15</sup>	51.31 <sup>8</sup>	31.6 <sup>7</sup>	39.36 <sup>17</sup>	
20.3	45.97 <sup>88</sup>	30.6 <sup>14</sup>	3.78 <sup>20</sup>	48.1 <sup>10</sup>	51.21 <sup>10</sup>	30.9 <sup>7</sup>	39.15 <sup>21</sup>	
30.3	45.00 <sup>97</sup>	31.3 <sup>7</sup>	3.57 <sup>21</sup>	48.7 <sup>6</sup>	51.09 <sup>12</sup>	30.4 <sup>5</sup>	38.91 <sup>24</sup>	
Feb. 9.2	43.98 <sup>102</sup>	31.4 <sup>1</sup>	3.34 <sup>23</sup>	48.8 <sup>1</sup>	50.95 <sup>14</sup>	29.9 <sup>5</sup>	38.65 <sup>26</sup>	
19.2	42.96 <sup>102</sup>	30.9 <sup>5</sup>	3.11 <sup>23</sup>	48.4 <sup>4</sup>	50.81 <sup>14</sup>	29.5 <sup>4</sup>	38.38 <sup>27</sup>	
Mar. 1.2	41.99 <sup>97</sup>	29.9 <sup>10</sup>	2.88 <sup>23</sup>	47.5 <sup>9</sup>	50.67 <sup>14</sup>	29.2 <sup>3</sup>	38.11 <sup>27</sup>	
11.2	41.10 <sup>89</sup>	28.3 <sup>16</sup>	2.67 <sup>21</sup>	46.1 <sup>14</sup>	50.54 <sup>13</sup>	29.1 <sup>1</sup>	37.87 <sup>24</sup>	
21.1	40.35 <sup>75</sup>	26.3 <sup>20</sup>	2.49 <sup>18</sup>	44.4 <sup>17</sup>	50.43 <sup>11</sup>	29.1 <sup>0</sup>	37.67 <sup>20</sup>	
31.1	39.75 <sup>60</sup>	23.9 <sup>24</sup>	2.34 <sup>15</sup>	42.3 <sup>21</sup>	50.35 <sup>8</sup>	29.3 <sup>2</sup>	37.52 <sup>15</sup>	
Apr. 10.1	39.35 <sup>40</sup>	21.2 <sup>27</sup>	2.23 <sup>11</sup>	39.8 <sup>25</sup>	50.30 <sup>5</sup>	29.7 <sup>4</sup>	37.42 <sup>10</sup>	
20.0	39.16 <sup>19</sup>	18.4 <sup>28</sup>	2.17 <sup>6</sup>	37.1 <sup>27</sup>	50.29 <sup>1</sup>	30.3 <sup>6</sup>	37.40 <sup>2</sup>	
30.0	39.19 <sup>3</sup>	15.5 <sup>29</sup>	2.17 <sup>0</sup>	34.1 <sup>30</sup>	50.33 <sup>4</sup>	31.1 <sup>8</sup>	37.45 <sup>5</sup>	
May 10.0	39.43 <sup>24</sup>	12.7 <sup>28</sup>	2.21 <sup>4</sup>	30.9 <sup>32</sup>	50.41 <sup>8</sup>	32.0 <sup>9</sup>	37.57 <sup>12</sup>	
20.0	39.89 <sup>46</sup>	10.0 <sup>27</sup>	2.31 <sup>10</sup>	27.7 <sup>32</sup>	50.54 <sup>13</sup>	33.2 <sup>12</sup>	37.76 <sup>19</sup>	
29.9	40.55 <sup>66</sup>	7.6 <sup>24</sup>	2.47 <sup>16</sup>	24.4 <sup>33</sup>	50.71 <sup>17</sup>	34.6 <sup>14</sup>	38.02 <sup>26</sup>	
June 8.9	41.39 <sup>84</sup>	5.6 <sup>20</sup>	2.67 <sup>20</sup>	21.2 <sup>32</sup>	50.92 <sup>21</sup>	36.1 <sup>15</sup>	38.35 <sup>33</sup>	
18.9	42.39 <sup>100</sup>	3.9 <sup>17</sup>	2.92 <sup>25</sup>	18.1 <sup>31</sup>	51.16 <sup>24</sup>	37.7 <sup>16</sup>	38.73 <sup>38</sup>	
28.9	43.51 <sup>112</sup>	2.6 <sup>13</sup>	3.21 <sup>29</sup>	15.2 <sup>29</sup>	51.43 <sup>27</sup>	39.4 <sup>17</sup>	39.15 <sup>42</sup>	
July 8.8	44.74 <sup>123</sup>	1.8 <sup>8</sup>	3.53 <sup>32</sup>	12.6 <sup>26</sup>	51.72 <sup>29</sup>	41.2 <sup>18</sup>	39.60 <sup>45</sup>	
18.8	46.04 <sup>130</sup>	3 <sup>3</sup>	3.87 <sup>34</sup>	10.4 <sup>22</sup>	52.03 <sup>31</sup>	43.0 <sup>18</sup>	40.07 <sup>47</sup>	
28.8	47.37 <sup>133</sup>	1.5 <sup>2</sup>	4.23 <sup>36</sup>	8.5 <sup>19</sup>	52.34 <sup>31</sup>	44.6 <sup>16</sup>	40.56 <sup>49</sup>	
Aug. 7.7	48.72 <sup>135</sup>	1.7 <sup>6</sup>	4.59 <sup>36</sup>	7.2 <sup>13</sup>	52.65 <sup>31</sup>	46.2 <sup>16</sup>	41.05 <sup>49</sup>	
17.7	50.06 <sup>134</sup>	2.3 <sup>12</sup>	4.94 <sup>35</sup>	6.3 <sup>9</sup>	52.96 <sup>31</sup>	47.6 <sup>14</sup>	41.52 <sup>47</sup>	
27.7	51.36 <sup>130</sup>	3.5 <sup>15</sup>	5.29 <sup>35</sup>	6.0 <sup>3</sup>	53.25 <sup>29</sup>	48.7 <sup>11</sup>	41.98 <sup>46</sup>	
Sept. 6.7	52.60 <sup>124</sup>	5.0 <sup>20</sup>	5.61 <sup>32</sup>	3 <sup>3</sup>	53.53 <sup>28</sup>	49.7 <sup>10</sup>	42.42 <sup>44</sup>	
16.6	53.76 <sup>116</sup>	7.0 <sup>24</sup>	6.3 <sup>29</sup>	6.3 <sup>7</sup>	53.79 <sup>26</sup>	50.4 <sup>7</sup>	42.83 <sup>41</sup>	
26.6	54.81 <sup>105</sup>	9.4 <sup>27</sup>	7.0 <sup>27</sup>	7.0 <sup>13</sup>	54.02 <sup>23</sup>	50.9 <sup>5</sup>	43.20 <sup>37</sup>	
Oct. 6.6	55.73 <sup>92</sup>	12.1 <sup>29</sup>	8.3 <sup>22</sup>	8.3 <sup>18</sup>	54.23 <sup>21</sup>	51.1 <sup>2</sup>	43.54 <sup>34</sup>	
16.6	56.51 <sup>78</sup>	15.0 <sup>32</sup>	10.1 <sup>19</sup>	10.1 <sup>22</sup>	54.41 <sup>18</sup>	51.1 <sup>0</sup>	43.83 <sup>29</sup>	
26.5	57.14 <sup>63</sup>	18.2 <sup>33</sup>	12.3 <sup>14</sup>	12.3 <sup>24</sup>	54.56 <sup>15</sup>	51.1 <sup>2</sup>	44.07 <sup>24</sup>	
Nov. 5.5	57.60 <sup>46</sup>	21.5 <sup>35</sup>	14.7 <sup>10</sup>	14.7 <sup>26</sup>	54.68 <sup>12</sup>	50.9 <sup>5</sup>	44.27 <sup>20</sup>	
15.5	57.87 <sup>27</sup>	25.0 <sup>34</sup>	17.3 <sup>5</sup>	17.3 <sup>28</sup>	54.78 <sup>10</sup>	50.4 <sup>6</sup>	44.41 <sup>14</sup>	
25.4	57.94 <sup>7</sup>	28.4 <sup>33</sup>	20.1 <sup>0</sup>	20.1 <sup>28</sup>	54.84 <sup>6</sup>	49.8 <sup>6</sup>	44.50 <sup>9</sup>	
Dec. 5.4	57.83 <sup>11</sup>	31.7 <sup>32</sup>	22.9 <sup>3</sup>	22.9 <sup>26</sup>	54.87 <sup>3</sup>	49.2 <sup>8</sup>	44.54 <sup>4</sup>	
15.4	57.52 <sup>31</sup>	34.9 <sup>29</sup>	25.5 <sup>8</sup>	25.5 <sup>24</sup>	54.87 <sup>0</sup>	48.4 <sup>8</sup>	44.54 <sup>3</sup>	
25.4	57.03 <sup>49</sup>	37.8 <sup>26</sup>	27.9 <sup>12</sup>	27.9 <sup>21</sup>	54.87 <sup>3</sup>	47.6 <sup>7</sup>	44.51 <sup>8</sup>	
35.3	56.36 <sup>67</sup>	40.4 <sup>22</sup>	30.0 <sup>15</sup>	30.0 <sup>18</sup>	54.84 <sup>6</sup>	46.9 <sup>8</sup>	44.43 <sup>13</sup>	
35.3	56.36 <sup>67</sup>	42.6 <sup>22</sup>	31.8 <sup>18</sup>	31.8 <sup>18</sup>	54.78 <sup>6</sup>	46.1 <sup>8</sup>	44.30 <sup>13</sup>	
Sec δ, Tan δ	5.283	+5.188	1.318	-0.858	1.002	+0.066	1.669	
Mean Place	43°.904	3''.53	2°.411	41''.34	50°.056	24''.85	37°.879	2
D'ψ a, Dω a	+0.09	-0.25	-0.02	+0.04	0.00	0.00	+0.02	
Dψ δ, Dω δ	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7	+0.3	

[Eph 13]

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\tau^3$ Eridani. Mag. 4.2		$\rho$ Persei. Var. 3.4-4.2		$\mu$ Horologii. Mag. 5.2		$\theta$ Hydri. Mag. 5.5	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 2 58 s	° ' " -23 56 "	h m 2 59 s	° ' " +38 30 "	h m 3 1 s	° ' " -60 3 "	h m 3 2 s	° ' " -72 13 "
Jan. 0.3	40.16	85.4	44.89	58.7	38.84	68.1	7.88	72.1
10.3	40.05 <sup>11</sup>	86.8 <sup>14</sup>	44.78 <sup>11</sup>	59.2 <sup>5</sup>	38.51 <sup>33</sup>	69.6 <sup>15</sup>	7.25 <sup>63</sup>	73.5 <sup>14</sup>
20.3	39.91 <sup>14</sup>	87.8 <sup>10</sup>	44.64 <sup>14</sup>	59.4 <sup>2</sup>	38.14 <sup>37</sup>	70.6 <sup>10</sup>	6.57 <sup>68</sup>	74.3 <sup>8</sup>
30.3	39.76 <sup>15</sup>	88.5 <sup>7</sup>	44.48 <sup>16</sup>	59.4 <sup>0</sup>	37.75 <sup>39</sup>	71.0 <sup>4</sup>	5.86 <sup>71</sup>	74.6 <sup>3</sup>
Feb. 9.2	39.59 <sup>17</sup> 18	88.8 <sup>3</sup> 0	44.29 <sup>19</sup> 19	59.0 <sup>4</sup> 6	37.34 <sup>41</sup> 41	70.9 <sup>1</sup> 7	5.13 <sup>73</sup> 73	74.2 <sup>4</sup> 9
19.2	39.41	88.8	44.10	58.4	36.93	70.2	4.40	73.3
Mar. 1.2	39.24 <sup>17</sup>	88.4 <sup>4</sup>	43.91 <sup>19</sup>	57.5 <sup>9</sup>	36.54 <sup>39</sup>	68.9 <sup>13</sup>	3.70 <sup>70</sup>	71.9 <sup>14</sup>
11.2	39.08 <sup>16</sup>	87.6 <sup>8</sup>	43.74 <sup>17</sup>	56.4 <sup>11</sup>	36.17 <sup>37</sup>	67.2 <sup>17</sup>	3.05 <sup>65</sup>	69.9 <sup>20</sup>
21.1	38.94 <sup>14</sup>	86.4 <sup>12</sup>	43.59 <sup>15</sup>	55.2 <sup>12</sup>	35.84 <sup>33</sup>	65.0 <sup>22</sup>	2.46 <sup>59</sup>	67.5 <sup>24</sup>
31.1	38.83 <sup>11</sup> 7	85.0 <sup>14</sup> 18	43.48 <sup>11</sup> 6	53.9 <sup>13</sup> 14	35.55 <sup>29</sup> 22	62.4 <sup>26</sup> 30	1.94 <sup>52</sup> 42	64.7 <sup>28</sup> 32
Apr. 10.1	38.76	83.2	43.42	52.5	35.33	59.4	1.52	61.5
20.0	38.73 <sup>3</sup>	81.2 <sup>20</sup>	43.41 <sup>1</sup>	51.2 <sup>13</sup>	35.17 <sup>16</sup>	56.2 <sup>32</sup>	1.21 <sup>31</sup>	58.1 <sup>34</sup>
30.0	38.74 <sup>1</sup>	78.9 <sup>23</sup>	43.46 <sup>5</sup>	49.9 <sup>13</sup>	35.09 <sup>8</sup>	52.7 <sup>35</sup>	1.01 <sup>20</sup>	54.5 <sup>36</sup>
May 10.0	38.80 <sup>6</sup>	76.4 <sup>25</sup>	43.56 <sup>10</sup>	48.9 <sup>10</sup>	35.08 <sup>1</sup>	49.1 <sup>36</sup>	0.93 <sup>8</sup>	50.9 <sup>36</sup>
20.0	38.91 <sup>11</sup> 15	73.8 <sup>26</sup> 27	43.72 <sup>16</sup> 22	48.0 <sup>9</sup> 6	35.15 <sup>7</sup> 15	45.5 <sup>36</sup> 36	0.97 <sup>4</sup> 17	47.2 <sup>37</sup> 37
29.9	39.06	71.1	43.94	47.4	35.30	41.9	1.14	43.5
June 8.9	39.26 <sup>20</sup>	68.4 <sup>27</sup>	44.20 <sup>26</sup>	47.1 <sup>3</sup>	35.53 <sup>23</sup>	38.4 <sup>35</sup>	1.42 <sup>28</sup>	40.0 <sup>35</sup>
18.9	39.49 <sup>23</sup>	65.7 <sup>27</sup>	44.51 <sup>31</sup>	47.0 <sup>1</sup>	35.82 <sup>29</sup>	35.1 <sup>33</sup>	1.82 <sup>40</sup>	36.8 <sup>32</sup>
28.9	39.76 <sup>27</sup>	63.1 <sup>26</sup>	44.85 <sup>34</sup>	47.3 <sup>3</sup>	36.17 <sup>35</sup>	32.1 <sup>30</sup>	2.31 <sup>49</sup>	33.8 <sup>30</sup>
July 8.8	40.05 <sup>29</sup> 31	60.7 <sup>24</sup> 22	45.22 <sup>37</sup> 38	47.8 <sup>5</sup> 8	36.57 <sup>40</sup> 45	29.4 <sup>27</sup> 22	2.89 <sup>58</sup> 65	31.2 <sup>26</sup> 20
18.8	40.36	58.5	45.60	48.6	37.02	27.2	3.54	29.2
28.8	40.67 <sup>31</sup>	56.6 <sup>19</sup>	45.99 <sup>39</sup>	49.6 <sup>10</sup>	37.49 <sup>47</sup>	25.5 <sup>17</sup>	4.23 <sup>69</sup>	27.6 <sup>16</sup>
Aug. 7.7	40.99 <sup>32</sup>	55.1 <sup>15</sup>	46.38 <sup>39</sup>	50.9 <sup>13</sup>	37.98 <sup>49</sup>	24.3 <sup>12</sup>	4.96 <sup>73</sup>	26.6 <sup>10</sup>
17.7	41.31 <sup>32</sup>	54.0 <sup>11</sup>	46.76 <sup>38</sup>	52.3 <sup>14</sup>	38.46 <sup>48</sup>	23.7 <sup>6</sup>	5.70 <sup>74</sup>	26.2 <sup>4</sup>
27.7	41.61 <sup>30</sup> 29	53.3 <sup>7</sup> 2	47.12 <sup>36</sup> 35	53.9 <sup>16</sup> 16	38.94 <sup>48</sup> 45	23.7 <sup>0</sup> 7	6.42 <sup>72</sup> 69	26.4 <sup>2</sup> 9
Sept. 6.7	41.90	53.1	47.47	55.5	39.39	24.4	7.11	27.3
16.6	42.16 <sup>26</sup>	53.3 <sup>2</sup>	47.80 <sup>33</sup>	57.3 <sup>18</sup>	39.80 <sup>41</sup>	25.6 <sup>12</sup>	7.74 <sup>63</sup>	28.7 <sup>14</sup>
26.6	42.40 <sup>24</sup>	54.0 <sup>7</sup>	48.10 <sup>30</sup>	59.1 <sup>18</sup>	40.17 <sup>37</sup>	27.4 <sup>18</sup>	8.29 <sup>55</sup>	30.7 <sup>20</sup>
Oct. 6.6	42.61 <sup>21</sup>	55.1 <sup>11</sup>	48.36 <sup>26</sup>	60.8 <sup>17</sup>	40.48 <sup>31</sup>	29.6 <sup>22</sup>	8.75 <sup>46</sup>	33.2 <sup>25</sup>
16.6	42.79 <sup>18</sup> 14	56.5 <sup>14</sup> 17	48.60 <sup>24</sup> 20	62.6 <sup>18</sup> 17	40.72 <sup>24</sup> 17	32.3 <sup>27</sup> 30	9.10 <sup>35</sup> 23	36.0 <sup>28</sup> 31
26.5	42.93	58.2	48.80	64.3	40.89	35.3	9.33	39.1
Nov. 5.5	43.04 <sup>11</sup>	60.2 <sup>20</sup>	48.96 <sup>16</sup>	66.0 <sup>17</sup>	40.99 <sup>10</sup>	38.4 <sup>31</sup>	9.43 <sup>10</sup>	42.4 <sup>33</sup>
15.5	43.11 <sup>7</sup>	62.3 <sup>21</sup>	49.09 <sup>13</sup>	67.6 <sup>16</sup>	41.01 <sup>2</sup>	41.7 <sup>33</sup>	9.40 <sup>3</sup>	45.8 <sup>34</sup>
25.4	43.15 <sup>4</sup>	64.5 <sup>22</sup>	49.17 <sup>8</sup>	69.0 <sup>14</sup>	40.96 <sup>5</sup>	44.9 <sup>32</sup>	9.24 <sup>16</sup>	49.0 <sup>32</sup>
Dec. 5.4	43.15 <sup>0</sup> 3	66.6 <sup>21</sup> 20	49.21 <sup>4</sup> 0	70.3 <sup>13</sup> 11	40.84 <sup>12</sup> 19	47.9 <sup>30</sup> 27	8.95 <sup>29</sup> 40	52.0 <sup>30</sup> 27
15.4	43.12	68.6	49.21	71.4	40.65	50.6	8.55	54.7
25.4	43.05 <sup>7</sup>	70.4 <sup>18</sup>	49.17 <sup>4</sup>	72.2 <sup>8</sup>	40.40 <sup>25</sup>	53.0 <sup>24</sup>	8.06 <sup>49</sup>	57.0 <sup>23</sup>
35.3	42.96 <sup>9</sup>	71.9 <sup>15</sup>	49.09 <sup>8</sup>	72.9 <sup>7</sup>	40.09 <sup>31</sup>	54.9 <sup>19</sup>	7.47 <sup>59</sup>	58.8 <sup>18</sup>
Sec. $\delta$ , Tan $\delta$	1.094	-0.444	1.278	+0.796	2.004	-1.736	3.277	-3.120
Mean Place	38°.655	85''.18	43°.446	41''.80	36°.362	60''.91	4°.123	63''.81
$D\mu$ , $D\alpha$	-0.01	+0.02	+0.01	-0.04	-0.03	+0.08	-0.06	+0.15
$D\delta$ , $D\alpha$	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Persei. (Algol.) Var. 2.1-3.2		$\delta$ Arietis. Mag. 4.5		12 Eridani. Mag. 4.0		48 H. Cephei. Mag. 5.5	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 3 2 s	° ' " + 40 37 " "	h m 3 6 s	° ' " + 19 24 " "	h m 3 8 s	° ' " - 29 18 " "	h m 3 9 s	° ' " + 77 25 " "
Jan. 0.4	39.42	61.8 6	47.32	33.6 2	29.17	79.2 15	33.12	49.5 20
10.3	39.31 11	62.4 6	47.25 7	33.4 2	29.05 12	80.7 15	32.52 60	51.5 20
20.3	39.16 15	62.7 3	47.14 11	33.1 3	28.90 15	81.8 11	31.80 72	52.9 14
30.3	38.99 17	62.7 0	47.02 12	32.7 4	28.73 17	82.6 8	30.99 81	53.8 9
Feb. 9.2	38.80 19	62.4 3	46.88 14	32.3 4	28.55 18	82.9 3	30.13 86	54.1 3
	20	6	16	5	19	1	88	3
19.2	38.60	61.8	46.72	31.8 6	28.36	82.8	29.25	53.8
Mar. 1.2	38.40 20	60.9 9	46.57 15	31.2 6	28.17 19	82.3 5	28.39 86	52.9
11.2	38.22 18	59.8 11	46.43 14	30.6 6	27.99 18	81.4 9	27.60 79	51.5 1
21.1	38.07 15	58.5 13	46.31 12	30.1 5	27.84 15	80.1 13	26.92 68	49.6 1
31.1	37.95 12	57.1 14	46.22 9	29.6 5	27.71 13	78.5 16	26.36 56	47.3 2
	7	14	6	5	9	19	40	2
Apr. 10.1	37.88	55.7	46.16	29.1 3	27.62	76.6 23	25.96 21	44.8
20.1	37.87 1	54.3 14	46.15 1	28.8 1	27.56 6	74.3 25	25.75 3	42.0
30.0	37.91 4	52.9 14	46.18 3	28.7 0	27.56 0	71.8 27	25.72 17	39.2
May 10.0	38.02 11	51.7 12	46.27 9	28.7 0	27.60 4	69.1 27	25.89 36	36.4
20.0	38.18 16	50.8 9	46.40 13	28.9 2	27.70 10	66.3 28	26.25 53	33.8
	22	8	18	5	14	29		
29.9	38.40	50.0	46.58	29.4 7	27.84	63.4 29	26.78 70	31.3
June 8.9	38.66 26	49.5 5	46.80 22	30.1 8	28.03 19	60.5 29	27.48 84	29.2
18.9	38.97 31	49.4 1	47.05 25	30.9 11	28.26 23	57.6 29	28.32 96	27.4
28.9	39.32 35	49.5 1	47.34 29	32.0 11	28.52 26	54.8 28	29.28 105	26.0
July 8.8	39.69 37	49.9 4	17.65 31	33.1 11	28.81 29	52.3 25	30.33 113	25.1
	39	7	32	13	31	23		
18.8	40.08	50.6	47.97	34.4 14	29.12	50.0 20	31.46 118	24.6
28.8	40.48 40	51.6 10	48.30 33	35.8 14	29.44 32	48.0 20	32.64 119	24.6
Aug. 7.8	40.88 40	52.7 11	48.63 33	37.2 14	29.77 33	46.5 15	33.83 119	25.0
17.7	41.27 39	54.1 14	48.96 33	38.6 14	30.10 33	45.3 12	35.02 119	25.9
27.7	41.65 38	55.7 16	49.28 32	40.0 14	30.41 31	44.7 6	36.19 117	27.3
	36	17	30	13	30	2	112	
Sept. 6.7	42.01	57.4	49.58	41.3 12	30.71	44.5 4	37.31 106	29.1
16.6	42.34 33	59.1 17	49.85 27	42.5 10	30.99 28	44.9 8	38.37 97	31.2
26.6	42.65 31	61.0 19	50.11 26	43.5 10	31.24 25	45.7 13	39.34 87	33.7
Oct. 6.6	42.93 28	62.8 18	50.34 23	44.5 8	31.47 23	47.0 16	40.21 75	36.5
16.6	43.17 24	64.7 19	50.55 21	45.3 6	31.66 19	48.6 20	40.96 62	39.5
	21	18	17		15			
26.5	43.38	66.5	50.72	45.9 5	31.81	50.6 22	41.58 48	42.7
Nov. 5.5	43.55 17	68.3 18	50.87 15	46.4 4	31.93 12	52.8 23	42.06 32	46.0
15.5	43.69 14	70.0 17	50.98 11	46.8 2	32.01 8	55.1 24	42.38 16	49.3
25.5	43.78 9	71.5 15	51.06 8	47.0 2	32.05 4	57.5 24	42.54 2	52.6
Dec. 5.4	43.82 4	72.9 14	51.11 5	47.2 0	32.05 0	59.9 24	42.52 19	55.8
	0	12	1	0	3	22		2
15.4	43.82	74.1	51.12	47.2 0	32.02	62.1 20	42.33 36	58.7
25.4	43.78 4	75.1 10	51.10 2	47.2 0	31.95 7	64.1 17	41.97 51	61.3
35.3	43.70 8	75.9 8	51.05 5	47.0 2	31.84 11	65.8	41.46	63.6
Sec $\delta$ , Tan $\delta$	1.318	+0.858	1.060	+0.352	1.147	-0.562	4.595	+4.484
Mean Place	37°.936	44''.41	45°.936	21''.70	27°.562	78''.00	29°.353	26''.39
D' $\psi$ $\alpha$ , D $\omega$ $\alpha$	+0.02	-0.04	+0.01	-0.02	-0.01	+0.03	+0.09	-0.20
D $\psi$ $\delta$ , D $\omega$ $\delta$	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♈ Arietis. Mag. 5.0		♏ Horologii (G.). Mag. 5.7		♋ Eridani. Mag. 4.9		♈ Arietis. Mag. 5.2	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 3 10 s	° ' + 20 43 "	h m 3 10 s	° ' - 57 37 "	h m 3 11 s	° ' - 9 7 "	h m 3 16 s	° ' + 20 50 "
Jan. 0.4	2.15	60.6	26.15	89.0	43.65	61.1	20.45	41.0
10.3	2.08 7	60.4 2	25.86 29	90.6 16	43.57 8	62.2 11	20.38 7	40.8 2
20.3	1.97 11	60.2 2	25.53 33	91.8 12	43.47 10	63.1 9	20.28 10	40.6 2
30.3	1.84 13	59.9 3	25.17 36	92.4 6	43.34 13	63.8 7	20.16 12	40.3 3
Feb. 9.2	1.70 14	59.4 5	24.79 38	92.4 0	43.19 15	64.3 5	20.01 15	39.9 4
	15	5	38	5	15	3	15	5
19.2	1.55	58.9	24.41	91.9	43.04	64.6	19.86	39.4
Mar. 1.2	1.39 16	58.3 6	24.04 37	90.8 11	42.89 15	64.6 0	19.70 16	38.9 5
11.2	1.25 14	57.7 6	23.69 35	89.2 16	42.74 15	64.3 3	19.56 14	38.3 6
21.1	1.12 13	57.1 6	23.38 31	87.1 21	42.62 12	63.8 5	19.43 13	37.7 6
31.1	1.03 9	56.6 5	23.11 27	84.6 25	42.52 10	63.0 8	19.33 10	37.2 5
	6	5	22	28	7	10	7	5
Apr. 10.1	0.97	56.1	22.89	81.8	42.45	62.0	19.26	36.7
20.1	0.96 1	55.7 4	22.73 16	78.7 31	42.42 3	60.8 12	19.24 2	36.3 4
30.0	0.99 3	55.5 2	22.65 8	75.3 34	42.43 1	59.3 15	19.27 3	36.0 3
May 10.0	1.07 8	55.4 1	22.63 2	71.8 35	42.49 6	57.6 17	19.34 7	36.0 0
20.0	1.20 13	55.6 2	22.69 6	68.2 36	42.60 11	55.8 18	19.46 12	36.1 1
	17	3	13	36	14	20	17	3
29.9	1.37	55.9	22.82	64.6	42.74	53.8	19.63	36.4
June 8.9	1.59 22	56.5 6	23.02 20	61.1 35	42.93 19	51.7 21	19.85 22	37.0 6
18.9	1.85 26	57.3 8	23.29 27	57.8 33	43.16 23	49.5 22	20.10 25	37.7 7
28.9	2.13 28	58.2 9	23.62 33	54.7 31	43.41 25	47.3 22	20.38 28	38.6 9
July 8.8	2.44 31	59.3 11	24.00 38	52.0 27	43.69 28	45.2 21	20.69 31	39.7 11
	32	13	41	23	30	20	32	12
18.8	2.76	60.6	24.41	49.7	43.99	43.2	21.01	40.9
28.8	3.10 34	61.9 13	24.85 44	47.8 19	44.29 30	41.4 18	21.34 33	42.2 13
Aug. 7.8	3.43 33	63.2 13	25.31 46	46.5 13	44.60 31	39.8 16	21.68 34	43.5 13
17.7	3.76 33	64.6 14	25.77 46	45.8 7	44.91 31	38.5 13	22.01 33	44.8 13
27.7	4.08 32	66.0 14	26.22 45	45.7 1	45.20 29	37.6 9	22.33 32	46.2 14
	30	13	43	5	28	7	30	12
Sept. 6.7	4.38	67.3	26.65	46.2	45.48	36.9	22.63	47.4
16.6	4.66 28	68.5 12	27.05 40	47.3 11	45.74 26	36.6 3	22.92 29	48.6 12
26.6	4.92 26	69.6 11	27.41 36	48.9 16	45.98 24	36.7 1	23.19 27	49.6 10
Oct. 6.6	5.16 24	70.6 10	27.72 31	51.1 22	46.20 22	37.1 4	23.43 24	50.6 10
16.6	5.37 21	71.4 8	27.96 24	53.7 26	46.39 19	37.8 7	23.64 21	51.4 8
	18	7	19	29	15	10	19	7
26.5	5.55	72.1	28.15	56.6	46.54	38.8	23.83	52.1
Nov. 5.5	5.70 15	72.6 5	28.26 11	59.7 31	46.67 13	40.0 12	23.99 16	52.6 5
15.5	5.82 12	73.1 5	28.31 5	62.9 32	46.77 10	41.4 14	24.11 12	53.1 5
25.5	5.91 9	73.4 3	28.28 3	66.1 32	46.84 7	42.8 14	24.20 9	53.4 3
Dec. 5.4	5.96 5	73.6 2	28.19 9	69.2 31	46.87 3	44.3 15	24.26 6	53.6 2
	1	2	16	28	0	15	2	1
15.4	5.97	73.8	28.03	72.0	46.87	45.8	24.28	53.7
25.4	5.95 2	73.8 0	27.82 21	74.4 24	46.84 3	47.1 13	24.27 1	53.7 0
35.3	5.90 5	73.7 1	27.55 27	76.4 20	46.78 6	48.4 13	24.22 5	53.7 0
Sec δ, Tan δ	1.069	+0.379	1.868	-1.578	1.013	-0.161	1.070	+0.381
Mean Place	0°.743	48''.35	23°.763	82''.62	42°.203	65''.10	19°.010	28''.80
Δα, Δδ	+0.01	-0.02	-0.03	+0.07	0.00	+0.01	+0.01	-0.02
Δα, Δδ	+0.3	+0.7	+0.3	+0.7	+0.3	+0.7	+0.3	+0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	<i>e</i> Eridani. Mag. 4.3		<i>z</i> Hydri. Mag. 5.5		<i>α</i> Persei. Mag. 1.9		<i>ο</i> Tauri. Mag. 3.8	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	I
	h m 3 16 s	° ' " -43 23 "	h m 3 17 s	° ' " -77 41 "	h m 3 18 s	° ' " +49 33 "	h m 3 20 s	
Jan. 0.4	33.86	43.1	68.48	65.3	16.56	53.3	15.65	
10.3	33.69 <sup>17</sup>	44.8 <sup>17</sup>	67.55 <sup>93</sup>	66.9 <sup>16</sup>	16.44 <sup>12</sup>	54.4 <sup>11</sup>	15.59 <sup>6</sup>	
20.3	33.49 <sup>20</sup>	46.1 <sup>13</sup>	66.54 <sup>101</sup>	67.9 <sup>10</sup>	16.27 <sup>17</sup>	55.1 <sup>7</sup>	15.50 <sup>9</sup>	
30.3	33.27 <sup>22</sup>	46.9 <sup>8</sup>	65.47 <sup>107</sup>	68.3 <sup>4</sup>	16.06 <sup>21</sup>	55.4 <sup>3</sup>	15.38 <sup>12</sup>	
Feb. 9.3	33.03 <sup>24</sup>	47.1 <sup>2</sup>	64.37 <sup>110</sup>	68.1 <sup>2</sup>	15.83 <sup>23</sup>	55.3 <sup>1</sup>	15.24 <sup>14</sup>	
	25	2	110	7	25	4	15	
19.2	32.78	46.9	63.27	67.4	15.58	54.9	15.09	
Mar 1.2	32.54 <sup>24</sup>	46.2 <sup>7</sup>	62.20 <sup>107</sup>	66.1 <sup>13</sup>	15.33 <sup>25</sup>	54.1 <sup>8</sup>	14.94 <sup>15</sup>	
11.2	32.31 <sup>23</sup>	45.0 <sup>12</sup>	61.19 <sup>101</sup>	64.2 <sup>19</sup>	15.10 <sup>23</sup>	52.9 <sup>12</sup>	14.80 <sup>14</sup>	
21.1	32.10 <sup>21</sup>	43.3 <sup>17</sup>	60.26 <sup>93</sup>	62.0 <sup>22</sup>	14.90 <sup>20</sup>	51.5 <sup>14</sup>	14.68 <sup>12</sup>	
31.1	31.92 <sup>18</sup>	41.3 <sup>20</sup>	59.43 <sup>83</sup>	59.3 <sup>27</sup>	14.74 <sup>16</sup>	50.0 <sup>15</sup>	14.58 <sup>10</sup>	
	13	24	70	31	11	18	7	
Apr. 10.1	31.79	38.9	58.73	56.2	14.63	48.2	14.51	
20.1	31.70 <sup>9</sup>	36.1 <sup>28</sup>	58.18 <sup>55</sup>	53.0 <sup>32</sup>	14.59 <sup>4</sup>	46.4 <sup>18</sup>	14.49 <sup>2</sup>	
30.0	31.66 <sup>4</sup>	33.1 <sup>30</sup>	57.78 <sup>40</sup>	49.5 <sup>35</sup>	14.61 <sup>2</sup>	44.7 <sup>17</sup>	14.50 <sup>1</sup>	
May 10.0	31.68 <sup>2</sup>	30.0 <sup>31</sup>	57.54 <sup>24</sup>	45.9 <sup>36</sup>	14.70 <sup>9</sup>	43.0 <sup>17</sup>	14.57 <sup>7</sup>	
20.0	31.76 <sup>8</sup>	26.7 <sup>33</sup>	57.48 <sup>6</sup>	42.2 <sup>37</sup>	14.86 <sup>16</sup>	41.5 <sup>15</sup>	14.68 <sup>11</sup>	
	13	34	12	36	22	13	15	
30.0	31.89	23.3	57.60	38.6	15.08	40.2	14.83	
June 8.9	32.08 <sup>19</sup>	20.0 <sup>33</sup>	57.88 <sup>28</sup>	35.1 <sup>35</sup>	15.36 <sup>28</sup>	39.2 <sup>10</sup>	15.03 <sup>20</sup>	
18.9	32.32 <sup>24</sup>	16.8 <sup>32</sup>	58.32 <sup>44</sup>	31.8 <sup>33</sup>	15.70 <sup>34</sup>	38.4 <sup>8</sup>	15.26 <sup>23</sup>	
28.9	32.60 <sup>28</sup>	13.8 <sup>30</sup>	58.92 <sup>60</sup>	28.8 <sup>30</sup>	16.08 <sup>38</sup>	38.0 <sup>4</sup>	15.52 <sup>26</sup>	
July 8.8	32.92 <sup>32</sup>	11.0 <sup>28</sup>	59.64 <sup>72</sup>	26.2 <sup>26</sup>	16.49 <sup>41</sup>	38.0 <sup>0</sup>	15.81 <sup>29</sup>	
	34	24	84	22	43	2	30	
18.8	33.26	8.6	60.48	24.0	16.92	38.2	16.11	
28.8	33.62 <sup>36</sup>	6.6 <sup>20</sup>	61.41 <sup>93</sup>	22.4 <sup>16</sup>	17.37 <sup>45</sup>	38.7 <sup>5</sup>	16.42 <sup>31</sup>	
Aug. 7.8	34.00 <sup>38</sup>	5.0 <sup>16</sup>	62.39 <sup>98</sup>	21.3 <sup>11</sup>	17.83 <sup>46</sup>	39.6 <sup>9</sup>	16.74 <sup>32</sup>	
17.7	34.37 <sup>37</sup>	4.0 <sup>10</sup>	63.40 <sup>101</sup>	20.8 <sup>5</sup>	18.28 <sup>45</sup>	40.7 <sup>11</sup>	17.05 <sup>31</sup>	
27.7	34.74 <sup>37</sup>	3.6 <sup>4</sup>	64.41 <sup>101</sup>	20.9 <sup>1</sup>	18.72 <sup>44</sup>	42.1 <sup>14</sup>	17.35 <sup>30</sup>	
	35	1	98	7	43	16	29	
Sept. 6.7	35.09	3.7	65.39	21.6	19.15	43.7	17.64	
16.7	35.42 <sup>33</sup>	4.4 <sup>7</sup>	66.29 <sup>90</sup>	22.9 <sup>13</sup>	19.55 <sup>40</sup>	45.5 <sup>18</sup>	17.91 <sup>27</sup>	
26.6	35.71 <sup>29</sup>	5.6 <sup>12</sup>	67.10 <sup>81</sup>	24.8 <sup>19</sup>	19.92 <sup>37</sup>	47.4 <sup>19</sup>	18.16 <sup>25</sup>	
Oct. 6.6	35.98 <sup>27</sup>	7.3 <sup>17</sup>	67.78 <sup>68</sup>	27.2 <sup>24</sup>	20.26 <sup>34</sup>	49.5 <sup>21</sup>	18.39 <sup>23</sup>	
16.6	36.20 <sup>22</sup>	9.5 <sup>22</sup>	68.31 <sup>53</sup>	30.0 <sup>28</sup>	20.56 <sup>30</sup>	51.6 <sup>21</sup>	18.60 <sup>21</sup>	
	18	25	36	31	26	21	18	
26.5	36.38	12.0	68.67	33.1	20.82	53.7	18.78	
Nov. 5.5	36.51 <sup>13</sup>	14.7 <sup>27</sup>	68.84 <sup>17</sup>	36.4 <sup>33</sup>	21.03 <sup>21</sup>	55.9 <sup>22</sup>	18.92 <sup>14</sup>	
15.5	36.59 <sup>8</sup>	17.6 <sup>29</sup>	68.82 <sup>2</sup>	39.7 <sup>33</sup>	21.20 <sup>17</sup>	58.0 <sup>21</sup>	19.04 <sup>12</sup>	
25.5	36.62 <sup>3</sup>	20.5 <sup>29</sup>	68.61 <sup>21</sup>	43.0 <sup>33</sup>	21.32 <sup>12</sup>	60.0 <sup>20</sup>	19.13 <sup>9</sup>	
Dec. 5.4	36.61 <sup>1</sup>	23.3 <sup>28</sup>	68.21 <sup>40</sup>	46.1 <sup>31</sup>	21.39 <sup>7</sup>	61.9 <sup>19</sup>	19.19 <sup>6</sup>	
	6	26	57	28	1	17	2	
15.4	36.55	25.9	67.64	48.9	21.40	63.6	19.21	
25.4	36.44 <sup>11</sup>	28.3 <sup>24</sup>	66.92 <sup>72</sup>	51.3 <sup>24</sup>	21.36 <sup>4</sup>	65.1 <sup>15</sup>	19.20 <sup>1</sup>	
35.4	36.30 <sup>14</sup>	30.3 <sup>20</sup>	66.06 <sup>86</sup>	53.3 <sup>20</sup>	21.26 <sup>10</sup>	66.4 <sup>13</sup>	19.15 <sup>5</sup>	
Sec δ, Tan δ	1.376	-0.945	4.692	-4.585	1.542	+1.174	1.012	
Mean Place	31° 960	39'' .34	63° 138	57'' .79	14° 796	34'' .51	14° 212	
D'ψ α, Dω α	-0.02	+0.04	-0.09	+0.20	+0.02	-0.05	0.00	
Dψ δ, Dω δ	+0.3	+0.8	+0.3	+0.8	+0.3	+0.8	+0.3	

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	2 H. Camelop. Mag. 4.4		ξ Tauri. Mag. 3.8		f Tauri. Mag. 4.3		ε Eridani. Mag. 3.8	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 3 22 s	° ' " + 59 38 "	h m 3 22 s	° ' " + 9 26 "	h m 3 26 s	° ' " + 12 38 "	h m 3 28 s	° ' " − 9 44 "
n. 0.4	12.70	63.1	35.09	22.1	12.16	56.1	57.01	38.6
10.3	12.52 18	64.6 15	35.02 7	21.5 6	12.10 6	55.7 4	56.94 7	39.9 13
20.3	12.28 24	65.6 10	34.93 9	21.0 5	12.01 9	55.3 4	56.84 10	40.9 10
30.3	11.99 29	66.2 6	34.81 12	20.5 5	11.89 12	54.8 5	56.71 13	41.7 8
b. 9.3	11.67 32 34	66.3 1 3	34.68 13 15	20.0 5 4	11.75 14 15	54.4 4 5	56.56 15 16	42.2 5 3
19.2	11.33	66.0	34.53	19.6	11.60	53.9	56.40	42.5
r. 1.2	10.99 34	65.3 7	34.38 15	19.2 4	11.45 15	53.5 4	56.24 16	42.6 1
11.2	10.68 31	64.1 12	34.24 14	19.0 2	11.31 14	53.2 3	56.09 15	42.4 2
21.1	10.40 28	62.5 16	34.11 13	18.8 2	11.18 13	52.9 3	55.95 14	41.9 5
31.1	10.18 22 16	60.7 18 21	34.01 10 7	18.7 1 1	11.07 11 7	52.7 2 1	55.83 12 8	41.2 7 10
r. 10.1	10.02	58.6	33.94	18.8	11.00	52.6	55.75	40.2
20.1	9.94 8	56.5 21	33.91 3	19.0 2	10.97 3	52.7 1	55.70 5	39.0 12
30.0	9.95 1	54.3 22	33.93 2	19.4 4	10.99 2	52.9 2	55.70 0	37.5 15
y 10.0	10.04 9	52.1 22	33.99 6	20.0 6	11.05 6	53.3 4	55.74 4	35.8 17
20.0	10.22 18 26	50.1 20 18	34.10 11 15	20.8 8 10	11.16 11 15	53.9 6 7	55.82 8 13	34.0 18 20
30.0	10.48	48.3	34.25	21.8	11.31	54.6	55.95	32.0
ie 8.9	10.81 33	46.7 16	34.45 20	22.9 11	11.50 19	55.6 10	56.12 17	29.9 21
18.9	11.21 40	45.5 12	34.68 23	24.2 13	11.73 23	56.7 11	56.33 21	27.7 22
28.9	11.67 46	44.6 9	34.94 26	25.6 14	12.00 27	57.9 12	56.57 24	25.6 21
y 8.8	12.17 50 53	44.1 5 1	35.23 29 30	27.1 15 15	12.29 29 30	59.3 14 14	56.84 27 29	23.5 21 20
18.8	12.70	44.0	35.53	28.6	12.59	60.7	57.13	21.5
28.8	13.26 56	44.2 2	35.84 31	30.1 15	12.90 31	62.1 14	57.43 30	19.7 18
g. 7.8	13.82 56	44.8 6	36.16 32	31.5 14	13.22 32	63.5 14	57.73 30	18.1 16
17.7	14.38 56	45.8 10	36.47 31	32.8 13	13.54 32	64.8 13	58.03 30	16.8 13
27.7	14.93 55 53	47.1 13 16	36.77 30 29	34.0 12 10	13.85 31 29	66.0 12 10	58.33 30 28	15.8 10 7
st. 6.7	15.46	48.7	37.06	35.0	14.14	67.0	58.61	15.1
16.7	15.96 50	50.6 19	37.34 28	35.9 9	14.42 28	67.9 9	58.88 27	14.8 3
26.6	16.43 47	52.7 21	37.59 25	36.5 6	14.68 26	68.7 8	59.13 25	14.9 1
.. 6.6	16.86 43	55.0 23	37.82 23	36.9 4	14.92 24	69.2 5	59.36 23	15.3 4
16.6	17.24 38 32	57.4 24 25	38.03 21 18	37.1 2 0	15.14 22 18	69.5 3 2	59.56 20 17	16.1 8 11
26.5	17.56	59.9	38.21	37.1	15.32	69.7	59.73	17.2
v. 5.5	17.83 27	62.5 26	38.37 16	36.9 2	15.48 16	69.8 1	59.88 15	18.4 12
15.5	18.04 21	65.1 26	38.49 12	36.7 2	15.61 13	69.7 1	59.99 11	19.9 15
25.5	18.18 14	67.7 26	38.58 9	36.3 4	15.71 10	69.5 2	60.07 8	21.4 15
.. 5.4	18.26 8 1	70.1 24 22	38.64 6 2	35.8 5 6	15.77 6 3	69.5 3 4	60.12 5 1	23.0 16 15
15.4	18.25	72.3	38.66	35.2	15.80	68.8	60.13	24.5
25.4	18.18 7	74.3 20	38.65 1	34.7 5	15.80 0	68.4 4	60.11 2	26.0 15
35.4	18.04 14	76.0 17	38.61 4	34.1 6	15.76 4	68.0 4	60.05 6	27.3 13
Tan δ	1.979	+1.708	1.014	+0.166	1.025	+0.224	1.015	−0.172
Place	10°.563	42''.66	33°.631	12''.97	10°.686	46''.18	55°.491	42''.81
D. α	+0.03	−0.07	0.00	−0.01	0.00	−0.01	0.00	+0.01
D. δ	+0.3	+0.8	+0.3	+0.8	+0.2	+0.8	+0.2	+0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\tau^5$ Eridani. Mag. 4.3		$\delta$ Persei. Mag. 3.1		$\delta$ Eridani. Mag. 3.7		$\nu$ M
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.
	h m 3 30 s	° ' " — 21 54 "	h m 3 36 s	° ' " + 47 31 "	h m 3 39 s	° ' " — 10 2 "	h m 3 36 s
Jan. 0.4	3.51	61.5	53.87	18.0	12.11	57.9	26.64
10.3	3.42 9	63.1 16	53.78 9	19.1 11	12.04 7	59.1 12	26.56
20.3	3.30 12	64.3 12	53.63 15	19.9 8	11.95 9	60.1 10	26.44
30.3	3.16 14	65.2 9	53.44 19	20.3 4	11.83 12	60.9 8	26.28
Feb. 9.3	2.99 17	65.8 6	53.22 22	20.4 1	11.68 15	61.5 6	26.09
	17	2	23	3	16	4	
19.2	2.82	66.0	52.99	20.1	11.52	61.9	25.88
Mar. 1.2	2.64 18	65.8 2	52.75 24	19.5 6	11.36 16	62.0 1	25.66
11.2	2.46 18	65.3 5	52.52 23	18.6 9	11.20 16	61.8 2	25.45
21.2	2.31 15	64.4 9	52.31 21	17.4 12	11.06 14	61.3 5	25.26
31.1	2.18 13	63.2 12	52.14 17	16.0 14	10.93 13	60.6 7	25.11
	10	15	12	16	9	10	
Apr. 10.1	2.08	61.7	52.02	14.4	10.84	59.6	25.00
20.1	2.01 7	60.0 17	51.96 6	12.7 17	10.79 5	58.4 12	24.94
30.0	2.00 1	57.9 21	51.96 0	11.1 16	10.78 1	56.9 15	24.94
May 10.0	2.03 3	55.6 23	52.02 6	9.5 16	10.81 3	55.3 16	25.00
20.0	2.10 7	53.2 24	52.15 13	8.1 14	10.89 8	53.4 19	25.12
	13	26	20	13	12	20	
30.0	2.23	50.6	52.35	6.8	11.01	51.4	25.30
June 8.9	2.39 16	48.0 26	52.60 25	5.7 11	11.17 16	49.3 21	25.53
18.9	2.60 21	45.4 26	52.90 30	5.0 7	11.37 20	47.1 22	25.82
28.9	2.84 24	42.8 26	53.25 35	4.5 5	11.61 24	44.9 22	26.14
July 8.9	3.11 27	40.3 25	53.64 39	4.3 2	11.87 26	42.8 21	26.50
	29	22	41	1	28	20	
18.8	3.40	38.1	54.05	4.4	12.15	40.8	26.88
28.8	3.71 31	36.1 20	54.48 43	4.8 4	12.45 30	39.0 18	27.28
Aug. 7.8	4.02 31	34.5 16	54.92 44	5.5 7	12.75 30	37.3 17	27.68
17.7	4.33 31	33.2 13	55.36 44	6.4 9	13.06 31	36.0 13	28.09
27.7	4.64 31	32.4 8	55.79 43	7.5 11	13.36 30	35.0 10	28.49
	30	4	42	14	29	7	
Sept. 6.7	4.94	32.0	56.21	8.9	13.65	34.3	28.88
16.7	5.22 28	32.0 0	56.61 40	10.4 15	13.92 27	34.0 3	29.25
26.6	5.47 25	32.5 5	56.99 38	12.1 17	14.18 26	34.1 1	29.60
Oct. 6.6	5.70 23	33.5 10	57.33 34	13.9 18	14.41 23	34.5 4	29.92
16.6	5.91 21	34.8 13	57.65 32	15.8 19	14.62 21	35.3 8	30.21
	18	16	28	19	19	10	
26.6	6.09	36.4	57.93	17.7	14.81	36.3	30.47
Nov. 5.5	6.23 14	38.3 19	58.17 24	19.6 19	14.96 15	37.6 13	30.70
15.5	6.33 10	40.4 21	58.36 19	21.6 20	15.09 13	39.1 15	30.88
25.5	6.40 7	42.6 22	58.50 14	23.4 18	15.18 9	40.7 16	31.02
Dec. 5.4	6.44 4	44.8 22	58.60 10	25.2 18	15.24 6	42.3 16	31.12
	0	20	4	17	2	16	
15.4	6.44	46.8	58.64	26.9	15.26	43.9	31.17
25.4	6.40 4	48.8 20	58.63 1	28.3 14	15.25 1	45.3 14	31.16
35.4	6.33 7	50.5 17	58.56 7	29.6 13	15.20 5	46.7 14	31.11
Sec $\delta$ , Tan $\delta$	1.078	—0.402	1.481	+1.092	1.016	—0.177	1.3
Mean Place	1 <sup>m</sup> .905	62 <sup>''</sup> .76	51 <sup>m</sup> .984	0 <sup>''</sup> .31	10 <sup>m</sup> .548	62 <sup>''</sup> .13	24 <sup>m</sup> .8
D $\psi$ $\alpha$ , D $\omega$ $\alpha$	—0.01	+0.02	+0.02	—0.04	0.00	+0.01	+0.02
D $\psi$ $\delta$ , D $\omega$ $\delta$	+0.2	+0.8	+0.2	+0.8	+0.2	+0.8	+0.2



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	δ H. Camelop. Mag. 4.7		η Tauri. (Alcyone.) Mag. 3.0		τ <sup>6</sup> Eridani. Mag. 4.3		γ Eridani. Mag. 4.2	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.
	h m 3 41 s	° ' +71 4 "	h m 3 42 s	° ' +23 50 "	h m 3 43 s	° ' -23 29 "	h m 3 46 s	° ' -36 26 "
Jan. 0.4	25.26	38.8	27.32	47.7	13.11	57.0	18.29	86.1
10.4	24.96 30	40.9 21	27.27 5	47.7 0	13.02 9	58.7 17	18.17 12	88.0 19
20.3	24.57 39	42.5 16	27.18 9	47.7 0	12.90 12	60.0 13	18.01 16	89.6 16
30.3	24.09 48	43.6 11	27.06 12	47.5 2	12.75 15	61.0 10	17.82 19	90.7 11
Feb. 9.3	23.56 53 56	44.2 6 0	26.92 14 16	47.3 2 4	12.58 17 18	61.7 7 3	17.61 21 22	91.4 7 2
19.2	23.00	44.2	26.76	46.9	12.40	62.0	17.39	91.6
Mar. 1.2	22.43 57	43.7 5	26.59 17	46.4 5	12.21 19	62.0 0	17.16 23	91.3 3
11.2	21.88 55	42.6 11	26.43 16	45.9 5	12.03 18	61.5 5	16.93 23	90.6 7
21.2	21.39 49	41.1 15	26.28 15	45.3 6	11.86 17	60.7 8	16.72 21	89.5 11
31.1	20.98 41 32	39.2 19 22	26.16 12 9	44.7 6 6	11.72 14 12	59.6 11 15	16.54 18 15	87.9 16 19
Apr. 10.1	20.66	37.0	26.07	44.1	11.60	58.1	16.39	86.0
20.1	20.45 21 8	34.6 24	26.03 4	43.6 5	11.53 7	56.3 18	16.28 11	83.7 23
30.1	20.37 8	32.0 26	26.03 0	43.2 4	11.50 3	54.2 21	16.22 6	81.1 26
May 10.0	20.42 5	29.4 26	26.08 5	42.9 3	11.51 1	51.9 23	16.21 1	78.3 28
20.0	20.60 18 31	26.9 25 23	26.18 10 15	42.7 2 1	11.57 6 11	49.5 24 26	16.25 4 9	75.4 29 31
30.0	20.91	24.6	26.33	42.8	11.68	46.9	16.34	72.3
June 8.9	21.34 43	22.4 22	26.52 19	43.1 3	11.83 15	44.2 27	16.49 15	69.2 31
18.9	21.87 53	20.5 19	26.76 24	43.5 4	12.03 20	41.5 27	16.68 19	66.1 31
28.9	22.49 62	19.0 15	27.03 27	44.1 6	12.26 23	38.9 26	16.91 23	63.1 30
July 8.9	23.19 70 76	17.8 12 7	27.32 29 32	44.9 8 9	12.52 26 28	36.5 24 23	17.18 27 30	60.3 28 25
18.8	23.95 80	17.1	27.64	45.8	12.80	34.2	17.48	57.8
28.8	24.75 80	16.8 3	27.97 33	46.8 10	13.10 30	32.2 20	17.80 32	55.7 21
Aug. 7.8	25.58 83	16.9 1	28.31 34	47.9 11	13.41 31	30.5 17	18.13 33	53.9 18
17.7	26.42 84	17.4 5	28.65 34	49.0 11	13.72 31	29.2 13	18.47 34	52.7 12
27.7	27.25 83 82	18.3 9 13	28.98 33 32	50.2 12 11	14.03 31 30	28.3 9 4	18.81 34 33	51.9 8 2
Sept 6.7	28.07	19.6	29.30	51.3	14.33	27.9	19.14	51.7
16.7	28.85 78	21.3 17	29.61 31	52.4 11	14.62 29	27.9 0	19.45 31	52.0 3
26.6	29.59 74	23.3 20	29.90 29	53.4 10	14.89 27	28.5 6	19.74 29	52.9 9
Oct. 6.6	30.27 68	25.6 23	30.17 27	54.3 9	15.13 24	29.4 9	20.00 26	54.2 13
16.6	30.88 61 53	28.2 26 27	30.41 24 21	55.1 8 7	15.35 22 18	30.8 14 17	20.23 23 20	56.1 19 22
26.6	31.41	30.9	30.62	55.8	15.53	32.5	20.43	58.3
Nov. 5.5	31.85 44	33.8 29	30.81 19	56.4 6	15.69 16	34.5 20	20.59 16	60.8 25
15.5	32.20 35	36.8 30	30.97 16	57.0 6	15.81 12	36.7 22	20.71 12	63.5 27
25.5	32.43 23	39.8 30	31.09 12	57.4 4	15.89 8	39.0 23	20.78 7	66.4 29
Dec. 5.4	32.55 12 1	42.8 30 28	31.18 9 5	57.8 4 2	15.94 5 1	41.3 23 23	20.81 3 1	69.2 28 26
15.4	32.56	45.6	31.23	58.0	15.95	43.6	20.80	71.8
25.4	32.44 12	48.1 25	31.24 1	58.2 2	15.92 3	45.7 21	20.74 6	74.3 25
35.4	32.21 23	50.3 22	31.21 3	58.3 1	15.85 7	47.5 18	20.64 10	76.5 22
Sec δ, Tan δ	3.083	+2.917	1.093	+0.442	1.091	-0.435	1.243	-0.739
Mean Place	21 <sup>h</sup> .890	17 <sup>m</sup> .87	25 <sup>h</sup> .719	35 <sup>m</sup> .18	11 <sup>h</sup> .433	58 <sup>m</sup> .26	16 <sup>h</sup> .434	84 <sup>m</sup> .91
D <sub>α</sub> , D <sub>ω</sub> α	+0.06	-0.11	+0.01	-0.02	-0.01	+0.02	-0.02	+0.03
D <sub>δ</sub> , D <sub>ω</sub> δ	+0.2	+0.8	+0.2	+0.8	+0.2	+0.8	+0.2	+0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	γ Hydri. Mag. 3.2		ζ Persel. Mag. 2.9		9 H. Camelop. Mag. 5.2		ε Persel. Mag. 3.0	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 3 48 s	° ' " -74 29 "	h m 3 48 s	° ' " +31 37 "	h m 3 49 s	° ' " +60 51 "	h m 3 52 s	° ' " +39 45 "
Jan. 0.4	37.03	64.3	48.81	69.6	55.29	58.8	10.60	70.7
10.4	36.37 66	66.3 20	48.76 5	70.1 5	55.14 15	60.6 18	10.53 7	71.5 8
20.3	35.62 75	67.8 15	48.67 9	70.3 2	54.92 22	61.9 13	10.42 11	72.1 6
30.3	34.80 82	68.8 10	48.54 13	70.4 1	54.64 28	62.8 9	10.28 14	72.4 3
Feb. 9.3	33.94 86 88	69.1 3 2	48.38 16 17	70.3 1 3	54.32 32 35	63.3 5 1	10.10 18 20	72.5 1 2
19.2	33.06 88	68.9 7	48.21 19	70.0 5	53.97 36	63.4 5	9.90 21	72.3 5
Mar. 1.2	32.18 84	68.2 14	48.02 18	69.5 6	53.61 35	62.9 9	9.69 20	71.8 7
11.2	31.34 80	66.8 18	47.84 16	68.9 8	53.26 32	62.0 13	9.49 19	71.1 9
21.2	30.54 73	65.0 23	47.68 13	68.1 8	52.94 27	60.7 16	9.30 15	70.2 11
31.1	29.81 64	62.7 26	47.55 10	67.3 9	52.67 20	59.1 19	9.15 12	69.1 12
Apr. 10.1	29.17 53	60.1 30	47.45 6	66.4 9	52.47 13	57.2 21	9.03 7	67.9 13
20.1	28.64 40	57.1 33	47.39 1	65.5 8	52.34 5	55.1 22	8.96 1	66.6 12
30.1	28.24 28	53.8 35	47.38 5	64.7 8	52.29 4	52.9 22	8.95 4	65.4 12
May 10.0	27.96 14	50.3 36	47.43 10	63.9 6	52.33 13	50.7 21	8.99 10	64.2 11
20.0	27.82 1	46.7 36	47.53 15	63.3 4	52.46 22	48.6 20	9.09 16	63.1 9
30.0	27.81 14	43.1 35	47.68 20	62.9 2	52.68 30	46.6 18	9.25 22	62.2 7
June 8.9	27.95 28	39.6 34	47.88 25	62.7 1	52.98 37	44.8 15	9.47 26	61.5 5
18.9	28.23 41	36.2 32	48.13 28	62.6 2	53.35 44	43.3 12	9.73 30	61.0 2
28.9	28.64 52	33.0 29	48.41 31	62.8 4	53.79 49	42.1 9	10.03 34	60.8 0
July 8.9	29.16 62	30.1 25	48.72 33	63.2 6	54.28 53	41.2 5	10.37 36	60.8 2
18.8	29.78 70	27.6 20	49.05 35	63.8 7	54.81 56	40.7 2	10.73 38	61.0 5
28.8	30.48 77	25.6 15	49.40 36	64.5 9	55.37 57	40.5 2	11.11 40	61.5 7
Aug. 7.8	31.25 81	24.1 9	49.76 36	65.4 10	55.94 59	40.7 6	11.51 39	62.2 8
17.8	32.06 83	23.2 4	50.12 36	66.4 11	56.53 58	41.3 9	11.90 38	63.0 10
27.7	32.89 81	22.8 3	50.48 34	67.5 11	57.11 57	42.2 12	12.29 38	64.0 12
Sept. 6.7	33.70 78	23.1 10	50.82 33	68.6 12	57.68 54	43.4 15	12.67 36	65.2 12
16.7	34.48 72	24.1 15	51.15 32	69.8 11	58.22 52	44.9 18	13.03 35	66.4 14
26.6	35.20 63	25.6 21	51.47 29	70.9 12	58.74 48	46.7 20	13.38 32	67.8 14
Oct. 6.6	35.83 52	27.7 26	51.76 27	72.1 11	59.22 44	48.7 22	13.70 30	69.2 14
16.6	36.35 40	30.3 29	52.03 24	73.2 11	59.66 39	50.9 23	14.00 27	70.6 15
26.6	36.75 26	33.2 32	52.27 21	74.3 10	60.05 34	53.2 25	14.27 23	72.1 14
Nov. 5.5	37.01 12	36.4 34	52.48 17	75.3 10	60.39 27	55.7 25	14.50 20	73.5 14
15.5	37.13 4	39.8 35	52.65 14	76.3 9	60.66 20	58.2 25	14.70 15	74.9 14
25.5	37.09 20	43.3 33	52.79 10	77.2 7	60.86 13	60.7 23	14.85 11	76.3 13
Dec. 5.5	36.89 33	46.6 31	52.89 6	78.1 7	60.99 5	63.2 23	14.96 6	77.6 12
15.4	36.56 47	49.7 28	52.95 1	78.8 6	61.04 3	65.5 22	15.02 2	78.8 11
25.4	36.09 60	52.5 23	52.96 3	79.4 5	61.01 11	67.7 19	15.04 4	79.9 10
35.4	35.49	54.8	52.93	79.9	60.90	69.6	15.00	80.9
Sec δ, Tan δ	3.741	-3.605	1.175	+0.616	2.054	+1.794	1.301	+0.832
Mean Place	32°.442	58''.93	47°.105	55''.55	52°.744	39''.62	8°.747	55''.06
D'ψ α, Dω α	-0.08	+0.13	+0.01	-0.02	+0.04	-0.06	+0.02	-0.03
Dψ δ, Dω δ	+0.2	+0.8	+0.2	+0.8	+0.2	+0.8	+0.2	+0.8

[Eph 15]

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ξ Persei. Mag. 4.0		γ Eridani. Mag. 3.2		λ Tauri. Var. 3.3-4.2		δ Reticuli. Mag. 4.4	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 3 53 s	° ' " + 35 32 "	h m 3 54 s	° ' " - 13 44 "	h m 3 55 s	° ' " + 12 15 "	h m 3 57 s	° ' " - 61 37 "
Jan. 0.4	28.55 6	65.4 6	5.43 6	55.0 14	59.77 4	13.1 4	26.53 30	86.7 23
10.4	28.49 10	66.0 5	5.37 10	56.4 12	59.73 7	12.7 4	26.23 36	89.0 18
20.3	28.39 13	66.5 2	5.27 12	57.6 10	59.66 11	12.3 5	25.87 40	90.8 12
30.3	28.26 16	66.7 0	5.15 15	58.6 7	59.55 13	11.8 4	25.47 44	92.0 6
Feb. 9.3	28.10 19	66.7 2	5.00 16	59.3 4	59.42 15	11.4 3	25.03 46	92.6 1
19.3	27.91 19	66.5 5	4.84 17	59.7 2	59.27 16	11.1 4	24.57 46	92.7 4
Mar. 1.2	27.72 19	66.0 7	4.67 17	59.9 2	59.11 16	10.7 3	24.11 45	92.3 10
11.2	27.53 18	65.3 8	4.50 16	59.7 5	58.95 14	10.4 2	23.66 43	91.3 16
21.2	27.35 15	64.5 9	4.34 13	59.2 8	58.81 12	10.2 2	23.23 39	89.7 20
31.1	27.20 11	63.6 11	4.21 11	58.4 10	58.69 10	10.0 1	22.84 33	87.7 24
Apr. 10.1	27.09 6	62.5 10	4.10 7	57.4 13	58.59 5	9.9 1	22.51 28	85.3 28
20.1	27.03 1	61.5 11	4.03 3	56.1 16	58.54 2	10.0 2	22.23 20	82.5 31
30.1	27.02 4	60.4 9	4.00 2	54.5 18	58.52 4	10.2 4	22.03 13	79.4 33
May 10.0	27.06 10	59.5 9	4.02 6	52.7 20	58.56 8	10.6 5	21.90 5	76.1 35
20.0	27.16 15	58.6 6	4.08 10	50.7 21	58.64 12	11.1 7	21.85 4	72.6 36
30.0	27.31 20	58.0 5	4.18 15	48.6 22	58.76 17	11.8 9	21.89 12	69.0 35
June 8.9	27.51 25	57.5 3	4.33 19	46.4 23	58.93 21	12.7 10	22.01 19	65.5 35
18.9	27.76 29	57.2 0	4.52 22	44.1 23	59.14 24	13.7 11	22.20 27	62.0 33
28.9	28.05 32	57.2 2	4.74 25	41.8 22	59.38 26	14.8 12	22.47 34	58.7 30
July 8.9	28.37 35	57.4 4	4.99 28	39.6 21	59.64 29	16.0 13	22.81 39	55.7 27
18.8	28.72 36	57.8 5	5.27 29	37.5 19	59.93 31	17.3 12	23.20 44	53.0 23
28.8	29.08 37	58.3 8	5.56 30	35.6 16	60.24 31	18.5 12	23.64 47	50.7 17
Aug. 7.8	29.45 38	59.1 9	5.86 30	34.0 14	60.55 32	19.7 12	24.11 50	49.0 11
17.8	29.83 37	60.0 10	6.16 30	32.6 10	60.87 31	20.9 11	24.61 50	47.9 6
27.7	30.20 36	61.0 11	6.46 30	31.6 6	61.18 30	22.0 9	25.11 49	47.3 0
Sept. 6.7	30.56 34	62.1 12	6.76 28	31.0 2	61.48 30	22.9 8	25.60 48	47.3 7
16.7	30.90 33	63.3 12	7.04 27	30.8 2	61.78 27	23.7 6	26.08 44	48.0 13
26.6	31.23 31	64.5 13	7.31 24	31.0 6	62.05 26	24.3 4	26.52 40	49.3 19
Oct. 6.6	31.54 29	65.8 12	7.55 22	31.6 9	62.31 24	24.7 2	26.92 35	51.2 23
16.6	31.83 25	67.0 13	7.77 20	32.5 13	62.55 21	24.9 0	27.27 28	53.5 28
26.6	32.08 22	68.3 12	7.97 17	33.8 15	62.76 19	24.9 1	27.55 20	56.3 32
Nov. 5.5	32.30 19	69.5 12	8.14 13	35.3 17	62.95 16	24.8 2	27.75 13	59.5 33
15.5	32.49 15	70.7 11	8.27 11	37.0 19	63.11 12	24.6 4	27.88 5	62.8 34
25.5	32.64 11	71.8 9	8.38 7	38.9 18	63.23 10	24.2 4	27.93 11	66.2 32
Dec. 5.5	32.75 6	72.9 9	8.45 3	40.8 16	63.33 6	23.8 4	27.89 11	69.6 32
15.4	32.81 2	73.8 7	8.48 0	42.6 18	63.39 2	23.4 4	27.78 19	72.8 29
25.4	32.83 3	74.7 7	8.48 5	44.4 16	63.41 2	23.0 5	27.59 27	75.7 25
35.4	32.80	75.4	8.43	46.0	63.39	22.5	27.32	78.2
Δ δ, Tan δ Mean Place	1.229 26°.756	+0.715 50''.68	1.029 3°.793	-0.245 58''.63	1.023 58°.159	+0.217 3''.56	2.105 23°.686	-1.852 82''.80
Δ α, D α α Δ δ, D δ δ	+0.02 +0.2	-0.03 +0.9	-0.01 +0.2	+0.01 +0.9	0.00 +0.2	-0.01 +0.9	-0.04 +0.2	+0.06 +0.9



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	γ Tauri. Mag. 3.9		α Tauri. Mag. 4.5		ε Persel. Mag. 4.0		δ Tauri. Mag. 5.6	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 3 58 s	° ' " + 5 45 "	h m 3 59 s	° ' " + 21 51 "	h m 4 2 s	° ' " + 47 29 "	h m 4 5 s	° ' " + 26 15 "
Jan. 0.4	39.61	23.4	41.73	13.7	31.25	28.4	40.83	48.4
10.4	39.57 <sup>4</sup>	22.6 <sup>8</sup>	41.69 <sup>4</sup>	13.7 <sup>0</sup>	31.18 <sup>7</sup>	29.6 <sup>12</sup>	40.79 <sup>4</sup>	48.6 <sup>2</sup>
20.3	39.50 <sup>7</sup>	22.0 <sup>6</sup>	41.62 <sup>7</sup>	13.6 <sup>1</sup>	31.06 <sup>12</sup>	30.5 <sup>9</sup>	40.72 <sup>7</sup>	48.7 <sup>1</sup>
30.3	39.39 <sup>11</sup>	21.4 <sup>6</sup>	41.51 <sup>11</sup>	13.4 <sup>2</sup>	30.89 <sup>17</sup>	31.2 <sup>7</sup>	40.61 <sup>11</sup>	48.8 <sup>1</sup>
Feb. 9.3	39.26 <sup>13</sup>	20.9 <sup>5</sup>	41.37 <sup>14</sup>	13.2 <sup>2</sup>	30.69 <sup>20</sup>	31.5 <sup>3</sup>	40.46 <sup>15</sup>	48.6 <sup>2</sup>
	<sup>15</sup>	<sup>4</sup>	<sup>16</sup>	<sup>3</sup>	<sup>23</sup>	<sup>0</sup>	<sup>16</sup>	<sup>2</sup>
19.3	39.11	20.5	41.21	12.9	30.46	31.5	40.30	48.4
Mar. 1.2	38.96 <sup>15</sup>	20.2 <sup>3</sup>	41.05 <sup>16</sup>	12.5 <sup>4</sup>	30.21 <sup>25</sup>	31.1 <sup>4</sup>	40.13 <sup>17</sup>	48.0 <sup>4</sup>
11.2	38.80 <sup>16</sup>	20.0 <sup>2</sup>	40.88 <sup>17</sup>	12.0 <sup>5</sup>	29.97 <sup>24</sup>	30.4 <sup>7</sup>	39.95 <sup>18</sup>	47.5 <sup>5</sup>
21.2	38.66 <sup>14</sup>	19.9 <sup>1</sup>	40.73 <sup>15</sup>	11.6 <sup>4</sup>	29.75 <sup>22</sup>	29.4 <sup>10</sup>	39.79 <sup>16</sup>	47.0 <sup>5</sup>
31.1	38.53 <sup>13</sup>	20.0 <sup>1</sup>	40.60 <sup>13</sup>	11.1 <sup>5</sup>	29.56 <sup>19</sup>	28.2 <sup>12</sup>	39.65 <sup>14</sup>	46.4 <sup>6</sup>
	<sup>10</sup>	<sup>2</sup>	<sup>10</sup>	<sup>5</sup>	<sup>15</sup>	<sup>14</sup>	<sup>11</sup>	<sup>7</sup>
Apr. 10.1	38.43	20.2	40.50	10.6	29.41	26.8	39.54	45.7
20.1	38.38 <sup>5</sup>	20.6 <sup>4</sup>	40.44 <sup>6</sup>	10.2 <sup>4</sup>	29.31 <sup>10</sup>	25.2 <sup>16</sup>	39.48 <sup>6</sup>	45.1 <sup>6</sup>
30.1	38.36 <sup>2</sup>	21.1 <sup>5</sup>	40.42 <sup>2</sup>	9.9 <sup>3</sup>	29.28 <sup>3</sup>	23.6 <sup>16</sup>	39.46 <sup>2</sup>	44.6 <sup>5</sup>
May 10.0	38.38 <sup>2</sup>	21.9 <sup>8</sup>	40.46 <sup>4</sup>	9.7 <sup>2</sup>	29.31 <sup>3</sup>	22.1 <sup>15</sup>	39.48 <sup>2</sup>	44.1 <sup>5</sup>
20.0	38.45 <sup>7</sup>	22.8 <sup>9</sup>	40.54 <sup>8</sup>	9.7 <sup>0</sup>	29.40 <sup>9</sup>	20.6 <sup>15</sup>	39.56 <sup>8</sup>	43.8 <sup>3</sup>
	<sup>12</sup>	<sup>10</sup>	<sup>13</sup>	<sup>1</sup>	<sup>16</sup>	<sup>14</sup>	<sup>13</sup>	<sup>1</sup>
30.0	38.57	23.8	40.67	9.8	29.56	19.2	39.69	43.7
June 9.0	38.73 <sup>16</sup>	25.1 <sup>13</sup>	40.84 <sup>17</sup>	10.1 <sup>3</sup>	29.78 <sup>22</sup>	18.0 <sup>12</sup>	39.87 <sup>18</sup>	43.7 <sup>0</sup>
18.9	38.93 <sup>20</sup>	26.4 <sup>13</sup>	41.06 <sup>22</sup>	10.5 <sup>4</sup>	30.06 <sup>28</sup>	17.0 <sup>10</sup>	40.08 <sup>21</sup>	43.8 <sup>1</sup>
28.9	39.16 <sup>23</sup>	27.8 <sup>14</sup>	41.31 <sup>25</sup>	11.1 <sup>6</sup>	30.39 <sup>33</sup>	16.3 <sup>7</sup>	40.34 <sup>26</sup>	44.2 <sup>4</sup>
July 8.9	39.42 <sup>26</sup>	29.3 <sup>15</sup>	41.59 <sup>28</sup>	11.9 <sup>8</sup>	30.75 <sup>36</sup>	15.9 <sup>4</sup>	40.63 <sup>29</sup>	44.7 <sup>5</sup>
	<sup>28</sup>	<sup>15</sup>	<sup>31</sup>	<sup>9</sup>	<sup>40</sup>	<sup>2</sup>	<sup>31</sup>	<sup>7</sup>
18.8	39.70	30.8	41.90	12.8	31.15	15.7	40.94	45.4
28.8	40.00 <sup>30</sup>	32.2 <sup>14</sup>	42.22 <sup>32</sup>	13.7 <sup>9</sup>	31.57 <sup>42</sup>	15.8 <sup>1</sup>	41.27 <sup>33</sup>	46.2 <sup>8</sup>
Aug. 7.8	40.30 <sup>30</sup>	33.6 <sup>14</sup>	42.55 <sup>33</sup>	14.7 <sup>10</sup>	32.00 <sup>43</sup>	16.2 <sup>4</sup>	41.60 <sup>33</sup>	47.0 <sup>8</sup>
17.8	40.61 <sup>31</sup>	34.8 <sup>12</sup>	42.88 <sup>33</sup>	15.8 <sup>11</sup>	32.44 <sup>44</sup>	16.8 <sup>6</sup>	41.94 <sup>34</sup>	47.9 <sup>9</sup>
27.7	40.92 <sup>31</sup>	35.8 <sup>10</sup>	43.21 <sup>33</sup>	16.8 <sup>10</sup>	32.88 <sup>44</sup>	17.6 <sup>8</sup>	42.29 <sup>35</sup>	48.9 <sup>10</sup>
	<sup>30</sup>	<sup>0</sup>	<sup>32</sup>	<sup>10</sup>	<sup>43</sup>	<sup>11</sup>	<sup>33</sup>	<sup>10</sup>
Sept. 6.7	41.22	36.7	43.53	17.8	33.31	18.7	42.62	49.9
16.7	41.50 <sup>28</sup>	37.3 <sup>6</sup>	43.84 <sup>31</sup>	18.7 <sup>9</sup>	33.72 <sup>41</sup>	19.9 <sup>12</sup>	42.94 <sup>32</sup>	50.8 <sup>9</sup>
26.7	41.77 <sup>27</sup>	37.7 <sup>4</sup>	44.14 <sup>30</sup>	19.5 <sup>8</sup>	34.12 <sup>40</sup>	21.3 <sup>14</sup>	43.25 <sup>31</sup>	51.7 <sup>9</sup>
Oct. 6.6	42.03 <sup>20</sup>	37.8 <sup>1</sup>	44.41 <sup>27</sup>	20.2 <sup>7</sup>	34.49 <sup>37</sup>	22.8 <sup>15</sup>	43.54 <sup>29</sup>	52.5 <sup>8</sup>
16.6	42.26 <sup>23</sup>	37.7 <sup>1</sup>	44.67 <sup>26</sup>	20.8 <sup>6</sup>	34.84 <sup>35</sup>	24.5 <sup>17</sup>	43.81 <sup>27</sup>	53.3 <sup>8</sup>
	<sup>21</sup>	<sup>3</sup>	<sup>23</sup>	<sup>6</sup>	<sup>31</sup>	<sup>17</sup>	<sup>24</sup>	<sup>7</sup>
26.6	42.47	37.4	44.90	21.4	35.15	26.2	44.05	54.0
Nov. 5.5	42.65 <sup>18</sup>	36.9 <sup>5</sup>	45.10 <sup>20</sup>	21.8 <sup>4</sup>	35.42 <sup>27</sup>	27.9 <sup>17</sup>	44.27 <sup>22</sup>	54.6 <sup>6</sup>
15.5	42.80 <sup>15</sup>	36.3 <sup>6</sup>	45.28 <sup>18</sup>	22.1 <sup>3</sup>	35.65 <sup>23</sup>	29.7 <sup>18</sup>	44.46 <sup>19</sup>	55.2 <sup>6</sup>
25.5	42.93 <sup>13</sup>	35.6 <sup>7</sup>	45.42 <sup>14</sup>	22.4 <sup>3</sup>	35.84 <sup>19</sup>	31.5 <sup>18</sup>	44.61 <sup>15</sup>	55.7 <sup>5</sup>
Dec. 5.5	43.02 <sup>9</sup>	34.8 <sup>8</sup>	45.52 <sup>10</sup>	22.6 <sup>2</sup>	35.97 <sup>13</sup>	33.3 <sup>18</sup>	44.72 <sup>11</sup>	56.2 <sup>5</sup>
	<sup>6</sup>	<sup>8</sup>	<sup>7</sup>	<sup>1</sup>	<sup>8</sup>	<sup>17</sup>	<sup>8</sup>	<sup>4</sup>
15.4	43.08	34.0	45.59	22.7	36.05	35.0	44.80	56.6
25.4	43.10 <sup>2</sup>	33.2 <sup>8</sup>	45.61 <sup>2</sup>	22.8 <sup>1</sup>	36.07 <sup>2</sup>	36.5 <sup>15</sup>	44.83 <sup>3</sup>	56.9 <sup>3</sup>
35.4	43.08 <sup>2</sup>	32.4 <sup>8</sup>	45.60 <sup>1</sup>	22.8 <sup>0</sup>	36.03 <sup>4</sup>	37.8 <sup>13</sup>	44.82 <sup>1</sup>	57.2 <sup>3</sup>
Sec δ, Tan δ	1.005	+0.101	1.077	+0.401	1.480	+1.091	1.115	+0.493
Mean Place	38°.001	15''.28	40°.052	1''.09	29°.150	11''.80	39°.079	35''.98
D'ψ α, Dω α	0.00	0.00	+0.01	-0.01	+0.03	-0.04	+0.01	-0.02
Dψ δ, Dω δ	+0.2	+0.9	+0.2	+0.9	+0.2	+0.9	+0.2	+0.9

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♋ Eridani. Mag. 4.1		♉ Tauri. Mag. 4.3		♏ Horologii. Mag. 3.8		♐ Reticuli. Mag. 3.4	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.
	h m 4 7 s	° ' " — 7 3 "	h m 4 10 s	° ' " + 8 40 "	h m 4 11 s	° ' " — 42 29 "	h m 4 13 s	° ' " — 62 40 "
Jan. 0.4	44.59	25.0	56.70	57.7	13.15	74.5	22.52	74.1
10.4	44.55 4	26.2 12	56.67 3	57.1 6	13.02 13	76.8 23	22.22 30	76.5 24
20.3	44.47 8	27.3 11	56.60 7	56.5 6	12.85 17	78.7 19	21.86 36	78.5 20
30.3	44.36 11	28.2 9	56.50 10	56.0 5	12.64 21	80.1 14	21.45 41	79.9 14
Feb. 9.3	44.22 14	28.9 7	56.37 13	55.6 4	12.40 24	81.1 10	21.00 45	80.8 9
	16	5	14	4	25	4	48	3
19.3	44.06	29.4	56.23	55.2	12.15	81.5	20.52	81.1
Mar. 1.2	43.90 16	29.6 2	56.07 16	54.9 3	11.88 27	81.5 0	20.03 49	80.8 3
11.2	43.73 17	29.6 0	55.91 16	54.6 3	11.61 27	81.0 5	19.55 48	80.1 7
21.2	43.58 15	29.4 2	55.76 15	54.5 1	11.36 25	79.9 11	19.09 46	78.8 13
31.2	43.44 14	28.9 5	55.63 13	54.5 0	11.13 23	78.5 14	18.67 42	77.0 18
	11	7	11	1	19	19	38	23
Apr. 10.1	43.33	28.2	55.52	54.6	10.94	76.6	18.29	74.7
20.1	43.26 7	27.2 10	55.45 7	54.8 2	10.78 16	74.3 23	17.97 32	72.1 26
30.1	43.22 4	26.0 12	55.43 2	55.2 4	10.67 11	71.8 25	17.73 24	69.1 30
May 10.0	43.23 1	24.6 14	55.44 1	55.7 5	10.62 5	68.9 29	17.56 17	65.9 32
20.0	43.28 5	23.0 16	55.50 6	56.4 7	10.62 0	65.9 30	17.47 9	62.5 34
	10	18	11	9	5	32	0	36
30.0	43.38	21.2	55.61	57.3	10.67	62.7	17.47	58.9
June 9.0	43.52 14	19.3 19	55.77 16	58.3 10	10.78 11	59.4 33	17.56 9	55.4 35
18.9	43.70 18	17.4 19	55.96 19	59.4 11	10.94 16	56.2 32	17.72 16	51.9 35
28.9	43.92 22	15.4 20	56.18 22	60.6 12	11.16 22	53.1 31	17.97 25	48.5 34
July 8.9	44.16 24	13.5 19	56.44 26	61.9 13	11.41 25	50.1 30	18.29 32	45.4 31
	27	19	27	14	29	27	37	27
18.9	44.43	11.6	56.71	63.3	11.70	47.4	18.66	42.7
28.8	44.71 28	9.8 18	57.01 30	64.6 13	12.02 32	45.1 23	19.09 43	40.3 24
Aug. 7.8	45.01 30	8.2 16	57.31 30	65.8 12	12.36 34	43.2 19	19.57 48	38.4 19
17.8	45.31 30	6.9 13	57.62 31	66.9 11	12.71 35	41.8 14	20.07 50	37.1 13
27.7	45.61 30	5.9 10	57.93 31	68.0 11	13.07 36	40.9 9	20.58 51	36.3 8
	30	7	30	8	35	3	51	1
Sept. 6.7	45.91	5.2	58.23	68.8	13.42	40.6	21.09	36.2
16.7	46.19 28	4.8 4	58.53 30	69.4 6	13.76 34	40.8 2	21.59 50	36.7 5
26.7	46.46 27	4.8 0	58.81 28	69.8 4	14.09 33	41.7 9	22.06 47	37.9 12
Oct. 6.6	46.71 25	5.1 3	59.07 26	70.0 2	14.39 30	43.1 14	22.49 43	39.6 17
16.6	46.95 24	5.8 7	59.31 24	70.0 0	14.66 27	45.0 19	22.87 38	41.9 23
	21	10	22	2	23	23	31	27
26.6	47.16	6.8	59.53	69.8	14.89	47.3	23.18	44.6
Nov. 5.6	47.34 18	8.0 12	59.73 20	69.5 3	15.08 19	50.0 27	23.42 24	47.7 31
15.5	47.49 15	9.4 14	59.90 17	69.0 5	15.23 15	52.9 29	23.58 16	51.0 33
25.5	47.61 12	10.9 15	60.04 14	68.4 6	15.32 9	56.0 31	23.66 8	54.5 35
Dec. 5.5	47.70 9	12.4 15	60.14 10	67.7 7	15.37 5	59.1 31	23.66 0	57.9 34
	6	16	7	7	0	30	10	33
15.4	47.76	14.0	60.21	67.0	15.37	62.1	23.56	61.2
25.4	47.77 1	15.5 15	60.24 3	66.3 7	15.32 5	64.9 28	23.39 17	64.3 31
35.4	47.75 2	16.9 14	60.24 0	65.7 6	15.21 11	67.4 25	23.13 26	67.0 27
Sec δ, Tan δ	1.008	−0.124	1.012	+0.153	1.356	−0.916	2.179	−1.936
Mean Place	42°.934	30''.28	55°.033	49''.08	11°.097	73''.56	19°.541	71''.08
D <sub>α</sub> a, D <sub>α</sub> a	0.00	0.00	0.00	0.00	−0.02	+0.03	−0.05	+0.06
D <sub>δ</sub> δ, D <sub>δ</sub> δ	+0.2	+0.9	+0.2	+0.9	+0.2	+0.9	+0.2	+0.9



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\delta$ Mensæ. Mag. 5.6		$m$ Persel. Mag. 6.1		$\alpha$ Tauri. (Aldebaran.) Mag. 1.1		$\nu$ Eridani. Mag. 4.1	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 4 23	° ' " -80 24	h m 4 27	° ' " +42 53	h m 4 31	° ' " +16 20	h m 4 32	° ' " - 3 31
Jan. 0.4	48.57	53.3	27.98	14.8	4.26	31.3	5.96	25.3
10.4	47.56 <sup>101</sup>	55.7 <sup>24</sup>	27.95 <sup>3</sup>	15.9 <sup>11</sup>	4.25 <sup>1</sup>	31.1 <sup>2</sup>	5.94 <sup>2</sup>	26.5 <sup>12</sup>
20.4	46.38 <sup>118</sup>	57.7 <sup>20</sup>	27.86 <sup>9</sup>	16.8 <sup>9</sup>	4.19 <sup>6</sup>	30.8 <sup>3</sup>	5.88 <sup>6</sup>	27.6 <sup>11</sup>
30.3	45.06 <sup>132</sup>	59.1 <sup>14</sup>	27.73 <sup>13</sup>	17.5 <sup>7</sup>	4.10 <sup>9</sup>	30.6 <sup>2</sup>	5.78 <sup>10</sup>	28.5 <sup>9</sup>
Feb. 9.3	43.64 <sup>142</sup>	59.9 <sup>8</sup>	27.56 <sup>17</sup>	17.9 <sup>4</sup>	3.98 <sup>12</sup>	30.3 <sup>3</sup>	5.66 <sup>12</sup>	29.2 <sup>7</sup>
19.3	42.16 <sup>148</sup>	60.2 <sup>3</sup>	27.35 <sup>21</sup>	18.0 <sup>1</sup>	3.83 <sup>15</sup>	30.0 <sup>3</sup>	5.51 <sup>15</sup>	29.7 <sup>5</sup>
Mar. 1.2	40.67 <sup>149</sup>	60.0 <sup>2</sup>	27.13 <sup>22</sup>	17.8 <sup>2</sup>	3.67 <sup>16</sup>	29.7 <sup>3</sup>	5.35 <sup>16</sup>	29.7 <sup>3</sup>
11.2	39.19 <sup>148</sup>	59.2 <sup>8</sup>	26.91 <sup>22</sup>	17.4 <sup>4</sup>	3.50 <sup>17</sup>	29.4 <sup>3</sup>	5.18 <sup>17</sup>	30.0 <sup>1</sup>
21.2	37.76 <sup>143</sup>	57.8 <sup>14</sup>	26.70 <sup>21</sup>	16.7 <sup>7</sup>	3.50 <sup>16</sup>	29.4 <sup>3</sup>	5.18 <sup>16</sup>	30.1 <sup>1</sup>
31.2	36.42 <sup>134</sup>	56.0 <sup>18</sup>	26.50 <sup>20</sup>	15.7 <sup>10</sup>	3.34 <sup>14</sup>	29.1 <sup>2</sup>	5.02 <sup>15</sup>	30.0 <sup>1</sup>
Apr. 10.1	35.21 <sup>121</sup>	53.8 <sup>22</sup>	26.35 <sup>15</sup>	14.6 <sup>11</sup>	3.20 <sup>12</sup>	28.9 <sup>2</sup>	4.87 <sup>12</sup>	29.7 <sup>5</sup>
20.1	34.14 <sup>107</sup>	51.2 <sup>26</sup>	26.24 <sup>11</sup>	13.4 <sup>12</sup>	3.08 <sup>8</sup>	28.7 <sup>1</sup>	4.75 <sup>9</sup>	29.2 <sup>7</sup>
30.1	33.24 <sup>90</sup>	48.3 <sup>29</sup>	26.18 <sup>6</sup>	12.1 <sup>13</sup>	3.00 <sup>8</sup>	28.6 <sup>1</sup>	4.66 <sup>9</sup>	28.5 <sup>7</sup>
May 10.1	32.54 <sup>70</sup>	45.1 <sup>32</sup>	26.18 <sup>0</sup>	10.8 <sup>13</sup>	2.96 <sup>4</sup>	28.5 <sup>1</sup>	4.61 <sup>5</sup>	27.5 <sup>10</sup>
20.0	32.05 <sup>49</sup>	41.7 <sup>34</sup>	26.25 <sup>7</sup>	9.5 <sup>13</sup>	2.96 <sup>0</sup>	28.6 <sup>1</sup>	4.60 <sup>1</sup>	26.4 <sup>11</sup>
30.0	31.77 <sup>28</sup>	38.3 <sup>34</sup>	26.37 <sup>12</sup>	8.3 <sup>12</sup>	3.01 <sup>5</sup>	28.8 <sup>2</sup>	4.63 <sup>3</sup>	25.1 <sup>13</sup>
June 9.0	31.72 <sup>5</sup>	34.8 <sup>35</sup>	26.55 <sup>18</sup>	7.2 <sup>11</sup>	3.10 <sup>8</sup>	29.2 <sup>1</sup>	4.71 <sup>9</sup>	23.6 <sup>15</sup>
18.9	31.90 <sup>18</sup>	31.4 <sup>34</sup>	26.78 <sup>23</sup>	6.4 <sup>8</sup>	3.24 <sup>14</sup>	29.7 <sup>5</sup>	4.83 <sup>12</sup>	22.0 <sup>16</sup>
28.9	32.29 <sup>39</sup>	28.2 <sup>32</sup>	27.06 <sup>28</sup>	5.7 <sup>7</sup>	3.42 <sup>18</sup>	30.3 <sup>6</sup>	4.99 <sup>16</sup>	20.3 <sup>17</sup>
July 8.9	32.89 <sup>60</sup>	25.2 <sup>30</sup>	27.38 <sup>32</sup>	5.3 <sup>4</sup>	3.64 <sup>22</sup>	31.0 <sup>7</sup>	5.19 <sup>20</sup>	18.5 <sup>18</sup>
18.9	33.67 <sup>78</sup>	22.5 <sup>27</sup>	27.73 <sup>35</sup>	5.0 <sup>3</sup>	3.89 <sup>25</sup>	31.8 <sup>8</sup>	5.42 <sup>23</sup>	16.7 <sup>18</sup>
28.8	34.62 <sup>95</sup>	20.2 <sup>23</sup>	28.11 <sup>38</sup>	5.0 <sup>0</sup>	4.16 <sup>27</sup>	32.8 <sup>10</sup>	5.67 <sup>25</sup>	15.0 <sup>17</sup>
Aug. 7.8	35.70 <sup>108</sup>	18.4 <sup>18</sup>	28.50 <sup>39</sup>	5.2 <sup>2</sup>	4.46 <sup>30</sup>	33.7 <sup>9</sup>	5.94 <sup>27</sup>	13.4 <sup>16</sup>
17.8	36.89 <sup>119</sup>	17.1 <sup>13</sup>	28.91 <sup>41</sup>	5.6 <sup>4</sup>	4.77 <sup>31</sup>	34.7 <sup>10</sup>	6.23 <sup>29</sup>	11.9 <sup>15</sup>
27.8	38.14 <sup>125</sup>	16.4 <sup>7</sup>	29.32 <sup>41</sup>	6.2 <sup>6</sup>	5.08 <sup>31</sup>	35.6 <sup>9</sup>	6.53 <sup>30</sup>	10.6 <sup>13</sup>
Sept. 6.7	39.42 <sup>128</sup>	16.4 <sup>0</sup>	29.72 <sup>40</sup>	6.2 <sup>8</sup>	5.40 <sup>32</sup>	36.4 <sup>8</sup>	6.83 <sup>30</sup>	9.6 <sup>10</sup>
16.7	40.67 <sup>125</sup>	17.0 <sup>6</sup>	30.12 <sup>40</sup>	7.0 <sup>9</sup>	5.72 <sup>32</sup>	37.2 <sup>8</sup>	7.12 <sup>29</sup>	8.9 <sup>7</sup>
26.7	41.86 <sup>119</sup>	18.1 <sup>11</sup>	30.51 <sup>39</sup>	7.9 <sup>9</sup>	6.03 <sup>31</sup>	37.8 <sup>6</sup>	7.41 <sup>29</sup>	8.5 <sup>4</sup>
Oct. 6.6	42.95 <sup>109</sup>	19.9 <sup>18</sup>	30.87 <sup>36</sup>	8.9 <sup>10</sup>	6.33 <sup>30</sup>	38.3 <sup>5</sup>	7.70 <sup>29</sup>	8.5 <sup>0</sup>
16.6	43.89 <sup>94</sup>	22.2 <sup>23</sup>	31.22 <sup>35</sup>	10.0 <sup>11</sup>	6.61 <sup>28</sup>	38.6 <sup>3</sup>	7.96 <sup>26</sup>	8.7 <sup>2</sup>
26.6	44.65 <sup>76</sup>	24.9 <sup>27</sup>	31.53 <sup>31</sup>	11.2 <sup>12</sup>	6.88 <sup>27</sup>	38.9 <sup>3</sup>	8.21 <sup>25</sup>	9.3 <sup>6</sup>
Nov. 5.6	45.20 <sup>55</sup>	28.0 <sup>31</sup>	31.82 <sup>29</sup>	12.5 <sup>13</sup>	7.13 <sup>25</sup>	38.9 <sup>0</sup>	8.44 <sup>23</sup>	10.1 <sup>8</sup>
15.5	45.51 <sup>31</sup>	31.3 <sup>33</sup>	32.07 <sup>25</sup>	13.9 <sup>14</sup>	7.35 <sup>22</sup>	38.9 <sup>0</sup>	8.65 <sup>21</sup>	11.2 <sup>11</sup>
25.5	45.58 <sup>7</sup>	34.7 <sup>34</sup>	32.28 <sup>21</sup>	15.3 <sup>14</sup>	7.55 <sup>20</sup>	38.8 <sup>1</sup>	8.83 <sup>18</sup>	12.4 <sup>12</sup>
Dec. 5.5	45.39 <sup>19</sup>	38.1 <sup>34</sup>	32.44 <sup>16</sup>	16.7 <sup>14</sup>	7.72 <sup>17</sup>	38.6 <sup>2</sup>	8.98 <sup>15</sup>	13.8 <sup>14</sup>
15.5	44.95 <sup>44</sup>	41.4 <sup>33</sup>	32.55 <sup>11</sup>	18.1 <sup>14</sup>	7.85 <sup>13</sup>	38.3 <sup>3</sup>	9.09 <sup>11</sup>	15.2 <sup>14</sup>
25.4	44.28 <sup>67</sup>	44.4 <sup>30</sup>	32.61 <sup>6</sup>	19.5 <sup>13</sup>	7.95 <sup>10</sup>	38.0 <sup>3</sup>	9.17 <sup>8</sup>	16.7 <sup>15</sup>
35.4	43.39 <sup>89</sup>	47.1 <sup>27</sup>	32.61 <sup>0</sup>	20.8 <sup>13</sup>	8.00 <sup>5</sup>	37.8 <sup>2</sup>	9.21 <sup>4</sup>	18.1 <sup>14</sup>
Sec $\delta$ , Tan $\delta$	6.003	-5.919	1.365	+0.929	1.042	+0.293	1.002	-0.062
Mean Place	41 <sup>s</sup> .271	50 <sup>''</sup> .32	25 <sup>s</sup> .825	0 <sup>''</sup> .24	2 <sup>s</sup> .478	21 <sup>''</sup> .52	4 <sup>s</sup> .240	31 <sup>''</sup> .42
$\nu$ $\delta$ , D <sub>0</sub> $\alpha$	-0.14	+0.16	+0.02	-0.02	+0.01	-0.01	0.00	0.00
$\nu$ $\delta$ , D <sub>0</sub> $\delta$	+0.2	+0.9	+0.2	+0.9	+0.2	+0.9	+0.1	+0.9

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\alpha$ Doradus. Mag. 3.5		53 Eridani. Mag. 4.0		$\tau$ Tauri. Mag. 4.3		Groombrid Mag.
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.
	h m 4 32 s	° ' " -55 12 "	h m 4 34 s	° ' " -14 27 "	h m 4 37 s	° ' " +22 47 "	h m 4 37 s
Jan. 0.4	12.07	75.1	18.91	65.5	10.35	52.0	27.91
10.4	11.88 <sup>19</sup>	77.7 <sup>26</sup>	18.88 <sup>3</sup>	67.2 <sup>17</sup>	10.35 <sup>0</sup>	52.1 <sup>1</sup>	27.67 <sup>24</sup>
20.4	11.63 <sup>25</sup>	79.9 <sup>22</sup>	18.80 <sup>8</sup>	68.7 <sup>15</sup>	10.30 <sup>5</sup>	52.1 <sup>0</sup>	27.28 <sup>39</sup>
30.3	11.33 <sup>30</sup>	81.6 <sup>17</sup>	18.70 <sup>10</sup>	69.9 <sup>12</sup>	10.21 <sup>9</sup>	52.1 <sup>0</sup>	26.74 <sup>54</sup>
Feb. 9.3	11.00 <sup>33</sup>	82.8 <sup>12</sup>	18.56 <sup>14</sup>	70.8 <sup>9</sup>	10.08 <sup>13</sup>	52.0 <sup>1</sup>	26.10 <sup>64</sup>
	36	7	17	6	15	1	73
19.3	10.64	83.5	18.39	71.4	9.93	51.9	25.37
Mar. 1.3	10.26 <sup>38</sup>	83.6 <sup>1</sup>	18.22 <sup>17</sup>	71.8 <sup>4</sup>	9.76 <sup>17</sup>	51.6 <sup>3</sup>	24.60 <sup>77</sup>
	38	4	18	0	17	3	78
11.2	9.88 <sup>38</sup>	83.2 <sup>4</sup>	18.04 <sup>18</sup>	71.8 <sup>0</sup>	9.59 <sup>17</sup>	51.3 <sup>3</sup>	23.82 <sup>78</sup>
21.2	9.51 <sup>37</sup>	82.2 <sup>10</sup>	17.87 <sup>17</sup>	71.5 <sup>3</sup>	9.42 <sup>17</sup>	51.0 <sup>3</sup>	23.07 <sup>75</sup>
31.2	9.17 <sup>34</sup>	80.7 <sup>15</sup>	17.71 <sup>16</sup>	70.9 <sup>6</sup>	9.27 <sup>15</sup>	50.6 <sup>4</sup>	22.39 <sup>68</sup>
	30	19	14	9	13	4	59
Apr. 10.1	8.87	78.8	17.57	70.0	9.14	50.2	21.80
20.1	8.61 <sup>26</sup>	76.5 <sup>23</sup>	17.47 <sup>10</sup>	68.9 <sup>11</sup>	9.05 <sup>9</sup>	49.8 <sup>4</sup>	21.34 <sup>46</sup>
30.1	8.40 <sup>21</sup>	73.8 <sup>27</sup>	17.40 <sup>7</sup>	67.5 <sup>14</sup>	9.00 <sup>5</sup>	49.4 <sup>4</sup>	21.02 <sup>32</sup>
May 10.1	8.26 <sup>14</sup>	70.8 <sup>30</sup>	17.38 <sup>2</sup>	65.8 <sup>17</sup>	9.00 <sup>0</sup>	49.1 <sup>3</sup>	20.86 <sup>16</sup>
20.0	8.18 <sup>8</sup>	67.6 <sup>32</sup>	17.40 <sup>2</sup>	63.9 <sup>19</sup>	9.05 <sup>5</sup>	49.0 <sup>1</sup>	20.86 <sup>0</sup>
	0	34	7	20	9	1	18
30.0	8.18	64.2	17.47	61.9	9.14	48.9	21.04
June 9.0	8.24 <sup>6</sup>	60.8 <sup>34</sup>	17.58 <sup>11</sup>	59.8 <sup>21</sup>	9.28 <sup>14</sup>	49.0 <sup>1</sup>	21.38 <sup>34</sup>
19.0	8.37 <sup>13</sup>	57.4 <sup>34</sup>	17.73 <sup>15</sup>	57.5 <sup>23</sup>	9.46 <sup>18</sup>	49.3 <sup>3</sup>	21.87 <sup>49</sup>
29.9	8.57 <sup>20</sup>	54.0 <sup>34</sup>	17.91 <sup>18</sup>	55.3 <sup>22</sup>	9.69 <sup>23</sup>	49.6 <sup>3</sup>	22.50 <sup>63</sup>
July 8.9	8.83 <sup>26</sup>	50.8 <sup>32</sup>	18.13 <sup>22</sup>	53.1 <sup>22</sup>	9.94 <sup>25</sup>	50.1 <sup>5</sup>	23.26 <sup>76</sup>
	30	28	25	21	28	6	86
18.9	9.13	48.0	18.38	51.0	10.22	50.7	24.12
28.8	9.48 <sup>35</sup>	45.4 <sup>26</sup>	18.65 <sup>27</sup>	49.0 <sup>20</sup>	10.53 <sup>31</sup>	51.4 <sup>7</sup>	25.08 <sup>96</sup>
Aug. 7.8	9.87 <sup>39</sup>	43.3 <sup>21</sup>	18.94 <sup>29</sup>	47.3 <sup>17</sup>	10.85 <sup>32</sup>	52.1 <sup>7</sup>	26.10 <sup>102</sup>
17.8	10.28 <sup>41</sup>	41.8 <sup>15</sup>	19.24 <sup>30</sup>	45.9 <sup>14</sup>	11.18 <sup>33</sup>	52.8 <sup>7</sup>	27.16 <sup>106</sup>
27.8	10.71 <sup>43</sup>	40.8 <sup>10</sup>	19.54 <sup>30</sup>	44.9 <sup>10</sup>	11.51 <sup>33</sup>	53.6 <sup>8</sup>	28.26 <sup>110</sup>
	43	4	29	7	33	7	111
Sept. 6.7	11.14	40.4	19.83	44.2	11.84	54.3	29.37
16.7	11.56 <sup>42</sup>	40.6 <sup>2</sup>	20.13 <sup>30</sup>	43.9 <sup>3</sup>	12.16 <sup>32</sup>	54.9 <sup>6</sup>	30.46 <sup>109</sup>
26.7	11.97 <sup>41</sup>	41.5 <sup>9</sup>	20.41 <sup>28</sup>	44.1 <sup>2</sup>	12.47 <sup>31</sup>	55.5 <sup>6</sup>	31.52 <sup>106</sup>
Oct. 6.6	12.35 <sup>38</sup>	42.9 <sup>14</sup>	20.68 <sup>27</sup>	44.6 <sup>5</sup>	12.77 <sup>30</sup>	56.0 <sup>5</sup>	32.54 <sup>102</sup>
16.6	12.69 <sup>34</sup>	45.0 <sup>21</sup>	20.93 <sup>25</sup>	45.6 <sup>10</sup>	13.06 <sup>29</sup>	56.4 <sup>4</sup>	33.49 <sup>95</sup>
	30	25	23	13	26	4	87
26.6	12.99	47.5	21.16	46.9	13.32	56.8	34.36
Nov. 5.6	13.23 <sup>24</sup>	50.4 <sup>29</sup>	21.36 <sup>20</sup>	48.5 <sup>16</sup>	13.56 <sup>24</sup>	57.1 <sup>3</sup>	35.13 <sup>77</sup>
15.5	13.42 <sup>19</sup>	53.6 <sup>32</sup>	21.54 <sup>18</sup>	50.3 <sup>18</sup>	13.78 <sup>22</sup>	57.3 <sup>2</sup>	35.78 <sup>65</sup>
25.5	13.54 <sup>12</sup>	57.0 <sup>34</sup>	21.68 <sup>14</sup>	52.3 <sup>20</sup>	13.96 <sup>18</sup>	57.5 <sup>2</sup>	36.29 <sup>51</sup>
Dec. 5.5	13.59 <sup>5</sup>	60.4 <sup>34</sup>	21.79 <sup>11</sup>	54.3 <sup>20</sup>	14.10 <sup>14</sup>	57.6 <sup>1</sup>	36.65 <sup>36</sup>
	2	33	7	21	11	1	20
15.5	13.57 <sup>8</sup>	63.7	21.86	56.4	14.21	57.7	36.85
25.4	13.49 <sup>8</sup>	66.9 <sup>32</sup>	21.89 <sup>3</sup>	58.4 <sup>20</sup>	14.27 <sup>6</sup>	57.8 <sup>1</sup>	36.88 <sup>3</sup>
35.4	13.34 <sup>15</sup>	69.8 <sup>29</sup>	21.88 <sup>1</sup>	60.2 <sup>18</sup>	14.29 <sup>2</sup>	57.9 <sup>1</sup>	36.74 <sup>14</sup>
Sec $\delta$ , Tan $\delta$	1.753	-1.440	1.033	-0.258	1.085	+0.420	4.074
Mean Place	9 <sup>s</sup> .519	73 <sup>''</sup> .84	17 <sup>s</sup> .155	69 <sup>''</sup> .75	8 <sup>s</sup> .495	41 <sup>''</sup> .21	22 <sup>s</sup> .320
$D'_{\psi} \alpha$ , $D_{\omega} \alpha$	-0.03	+0.03	-0.01	+0.01	+0.01	-0.01	+0.10
$D'_{\psi} \delta$ , $D_{\omega} \delta$	+0.1	+0.9	+0.1	+0.9	+0.1	+0.9	+0.1

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\alpha$ Coeli. Mag. 4.5		$\epsilon$ Camelop. Mag. 5.4		$\mu$ Eridani. Mag. 4.2		$\pi^3$ Orionis. Mag. 3.3	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 4 37 s	° ' -42 1 "	h m 4 40 s	° ' +56 36 "	h m 4 41 s	° ' - 3 24 "	h m 4 45 s	° ' + 6 48 "
Jan. 0.4	51.37 <sup>10</sup>	32.7 <sup>26</sup>	57.86 <sup>5</sup>	42.6 <sup>18</sup>	16.84 <sup>1</sup>	28.4 <sup>12</sup>	15.25 <sup>0</sup>	57.7 <sup>7</sup>
10.4	51.27 <sup>15</sup>	35.3 <sup>21</sup>	57.81 <sup>12</sup>	44.4 <sup>16</sup>	16.83 <sup>6</sup>	29.6 <sup>11</sup>	15.25 <sup>5</sup>	57.0 <sup>7</sup>
20.4	51.12 <sup>20</sup>	37.4 <sup>17</sup>	57.69 <sup>19</sup>	46.0 <sup>13</sup>	16.77 <sup>9</sup>	30.7 <sup>10</sup>	15.20 <sup>8</sup>	56.3 <sup>6</sup>
30.3	50.92 <sup>22</sup>	39.1 <sup>13</sup>	57.50 <sup>24</sup>	47.3 <sup>9</sup>	16.68 <sup>12</sup>	31.7 <sup>7</sup>	15.12 <sup>11</sup>	55.7 <sup>5</sup>
Feb. 9.3	50.70 <sup>26</sup>	40.4 <sup>8</sup>	57.26 <sup>28</sup>	48.2 <sup>5</sup>	16.56 <sup>15</sup>	32.4 <sup>6</sup>	15.01 <sup>14</sup>	55.2 <sup>4</sup>
19.3	50.44 <sup>27</sup>	41.2 <sup>2</sup>	56.98 <sup>31</sup>	48.7 <sup>1</sup>	16.41 <sup>16</sup>	33.0 <sup>3</sup>	14.87 <sup>16</sup>	54.8 <sup>3</sup>
Mar. 1.3	50 17 <sup>27</sup>	41.4 <sup>2</sup>	56.67 <sup>32</sup>	48.8 <sup>4</sup>	16.25 <sup>17</sup>	33.3 <sup>1</sup>	14.71 <sup>16</sup>	54.5 <sup>2</sup>
11.2	49.90 <sup>26</sup>	41.2 <sup>7</sup>	56.35 <sup>31</sup>	48.4 <sup>7</sup>	16.08 <sup>16</sup>	33.4 <sup>0</sup>	14.55 <sup>16</sup>	54.3 <sup>1</sup>
21.2	49.64 <sup>25</sup>	40 5 <sup>12</sup>	56.04 <sup>27</sup>	47.7 <sup>11</sup>	15.92 <sup>15</sup>	33.4 <sup>3</sup>	14.39 <sup>15</sup>	54.2 <sup>0</sup>
31.2	49.39 <sup>22</sup>	39.3 <sup>16</sup>	55.77 <sup>24</sup>	46.6 <sup>14</sup>	15.77 <sup>13</sup>	33.1 <sup>5</sup>	14.24 <sup>13</sup>	54.2 <sup>1</sup>
Apr. 10.1	49.17 <sup>18</sup>	37.7 <sup>20</sup>	55.53 <sup>18</sup>	45.2 <sup>16</sup>	15.64 <sup>9</sup>	32.6 <sup>7</sup>	14.11 <sup>9</sup>	54.3 <sup>3</sup>
20.1	48.99 <sup>13</sup>	35.7 <sup>23</sup>	55.35 <sup>11</sup>	43.6 <sup>18</sup>	15.55 <sup>6</sup>	31.9 <sup>9</sup>	14.02 <sup>6</sup>	54.6 <sup>4</sup>
30.1	48.86 <sup>9</sup>	33.4 <sup>27</sup>	55.24 <sup>4</sup>	41.8 <sup>20</sup>	15.49 <sup>2</sup>	31.0 <sup>11</sup>	13.96 <sup>1</sup>	55.0 <sup>6</sup>
May 10.1	48.77 <sup>3</sup>	30.7 <sup>29</sup>	55.20 <sup>4</sup>	39.8 <sup>20</sup>	15.47 <sup>2</sup>	29.9 <sup>13</sup>	13.95 <sup>3</sup>	55.6 <sup>7</sup>
20.0	48.74 <sup>2</sup>	27.8 <sup>31</sup>	55.24 <sup>12</sup>	37.8 <sup>19</sup>	15.49 <sup>7</sup>	28.6 <sup>14</sup>	13.98 <sup>8</sup>	56.3 <sup>9</sup>
30.0	48.76 <sup>8</sup>	24.7 <sup>31</sup>	55.36 <sup>20</sup>	35.9 <sup>18</sup>	15.56 <sup>12</sup>	27.2 <sup>16</sup>	14.06 <sup>12</sup>	57.2 <sup>10</sup>
June 9.0	48.84 <sup>13</sup>	21.6 <sup>32</sup>	55.56 <sup>26</sup>	34.1 <sup>16</sup>	15.68 <sup>15</sup>	25.6 <sup>17</sup>	14.18 <sup>16</sup>	58.2 <sup>11</sup>
19.0	48.97 <sup>18</sup>	18.4 <sup>32</sup>	55.82 <sup>33</sup>	32.5 <sup>15</sup>	15.83 <sup>19</sup>	23.9 <sup>17</sup>	14.34 <sup>19</sup>	59.3 <sup>12</sup>
28.9	49.15 <sup>22</sup>	15.2 <sup>30</sup>	56.15 <sup>39</sup>	31.0 <sup>12</sup>	16.02 <sup>22</sup>	22.2 <sup>18</sup>	14.53 <sup>23</sup>	60.5 <sup>13</sup>
July 8.9	49.37 <sup>27</sup>	12.2 <sup>28</sup>	56.54 <sup>43</sup>	29.8 <sup>10</sup>	16.24 <sup>25</sup>	20.4 <sup>17</sup>	14.76 <sup>26</sup>	61.8 <sup>12</sup>
18.9	49.64 <sup>29</sup>	9.4 <sup>25</sup>	56.97 <sup>47</sup>	28.8 <sup>6</sup>	16.49 <sup>27</sup>	18.7 <sup>16</sup>	15.02 <sup>27</sup>	63.0 <sup>13</sup>
28.8	49.93 <sup>32</sup>	6.9 <sup>20</sup>	57.44 <sup>50</sup>	28.2 <sup>4</sup>	16.76 <sup>28</sup>	17.1 <sup>14</sup>	15.29 <sup>29</sup>	64.3 <sup>11</sup>
Aug. 7.8	50.25 <sup>34</sup>	4.9 <sup>16</sup>	57.94 <sup>51</sup>	27.8 <sup>1</sup>	17.04 <sup>29</sup>	15.7 <sup>12</sup>	15.58 <sup>30</sup>	65.4 <sup>11</sup>
17.8	50.59 <sup>36</sup>	3.3 <sup>11</sup>	58.45 <sup>52</sup>	27.7 <sup>3</sup>	17.33 <sup>30</sup>	14.5 <sup>10</sup>	15.88 <sup>30</sup>	66.5 <sup>8</sup>
27.8	50.95 <sup>35</sup>	2.2 <sup>6</sup>	58.97 <sup>53</sup>	28.0 <sup>5</sup>	17.63 <sup>30</sup>	13.5 <sup>7</sup>	16.18 <sup>31</sup>	67.3 <sup>7</sup>
Sept. 6.7	51.30 <sup>34</sup>	1.6 <sup>0</sup>	59.50 <sup>52</sup>	28.5 <sup>7</sup>	17.93 <sup>29</sup>	12.8 <sup>4</sup>	16.49 <sup>30</sup>	68.0 <sup>5</sup>
16.7	51.64 <sup>34</sup>	1.6 <sup>7</sup>	60.02 <sup>51</sup>	29.2 <sup>10</sup>	18.22 <sup>29</sup>	12.4 <sup>1</sup>	16.79 <sup>29</sup>	68.5 <sup>3</sup>
26.7	51.98 <sup>31</sup>	2.3 <sup>12</sup>	60.53 <sup>48</sup>	30.2 <sup>13</sup>	18.51 <sup>27</sup>	12.3 <sup>2</sup>	17.08 <sup>28</sup>	68.8 <sup>0</sup>
Oct. 6.7	52.29 <sup>29</sup>	3.5 <sup>17</sup>	61.01 <sup>46</sup>	31.5 <sup>15</sup>	18.78 <sup>25</sup>	12.5 <sup>6</sup>	17.36 <sup>27</sup>	68.8 <sup>2</sup>
16.6	52.58 <sup>26</sup>	5.2 <sup>22</sup>	61.47 <sup>43</sup>	33.0 <sup>16</sup>	19.03 <sup>24</sup>	13.1 <sup>8</sup>	17.63 <sup>24</sup>	68.6 <sup>4</sup>
26.6	52.84 <sup>22</sup>	7.4 <sup>26</sup>	61.90 <sup>38</sup>	34.6 <sup>19</sup>	19.27 <sup>21</sup>	13.9 <sup>11</sup>	17.87 <sup>23</sup>	68.2 <sup>6</sup>
Nov. 5.6	53.06 <sup>18</sup>	10.0 <sup>29</sup>	62.28 <sup>34</sup>	36.5 <sup>20</sup>	19.48 <sup>19</sup>	15.0 <sup>13</sup>	18.10 <sup>20</sup>	67.6 <sup>7</sup>
15.5	53.24 <sup>14</sup>	12.9 <sup>31</sup>	62.62 <sup>28</sup>	38.5 <sup>20</sup>	19.67 <sup>16</sup>	16.3 <sup>14</sup>	18.30 <sup>17</sup>	66.9 <sup>9</sup>
25.5	53.38 <sup>8</sup>	16.0 <sup>32</sup>	62.90 <sup>22</sup>	40.5 <sup>22</sup>	19.83 <sup>12</sup>	17.7 <sup>15</sup>	18.47 <sup>14</sup>	66.0 <sup>9</sup>
Dec. 5.5	53.46 <sup>3</sup>	19.2 <sup>31</sup>	63.12 <sup>14</sup>	42.7 <sup>21</sup>	19.95 <sup>9</sup>	19.2 <sup>14</sup>	18.61 <sup>10</sup>	65.1 <sup>8</sup>
15.5	53.49 <sup>2</sup>	22.3 <sup>30</sup>	63.26 <sup>8</sup>	44.8 <sup>20</sup>	20.04 <sup>5</sup>	20.6 <sup>15</sup>	18.71 <sup>6</sup>	64.3 <sup>9</sup>
25.4	53.47 <sup>8</sup>	25.3 <sup>27</sup>	63.34 <sup>1</sup>	46.8 <sup>19</sup>	20.09 <sup>1</sup>	22.1 <sup>13</sup>	18.77 <sup>2</sup>	63.4 <sup>8</sup>
35.4	53.39	28.0	63.33	48.7	20.10	23.4	18.79	62.6
Sec $\delta$ , Tan $\delta$	1.346	-0.901	1.817	+1.517	1.002	-0.060	1.007	+0.120
Mean Place	49°.265	33''.14	55°.036	27''.09	15°.094	34''.58	13°.471	49''.86
$D_{\phi}a$ , $D_{\omega}a$	-0.02	+0.02	+0.04	-0.03	0.00	0.00	0.00	0.00
$D_{\phi}\delta$ , $D_{\omega}\delta$	+0.1	+0.9	+0.1	+0.9	+0.1	+0.9	+0.1	+0.9



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	9 Camelop. Mag. 4.4		ι Tauri. Mag. 5.1		π <sup>s</sup> Orionis. Mag. 3.9		ι Aurigæ. Mag. 2.9	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 4 45 s	° ' +66 11 "	h m 4 46 s	° ' +18 41 "	h m 4 49 s	° ' + 2 18 "	h m 4 51 s	° ' +33 1 "
Jan. 0.4	39.25	75.7	25.85	55.9	51.16	15.8	29.42	69.0
10.4	39.16 9	77.9 22	25.85 0	55.7 2	51.16 0	14.8 10	29.42 0	69.6 6
20.4	38.98 18	79.9 20	25.81 4	55.6 1	51.11 5	13.9 9	29.37 5	70.1 5
30.3	38.70 28	81.5 16	25.73 8	55.4 2	51.03 8	13.2 7	29.28 9	70.5 4
Feb. 9.3	38.35 35 41	82.7 12 8	25.61 12 15	55.2 2	50.91 12 14	12.5 7 4	29.15 13 17	70.8 3 1
19.3	37.94	83.5	25.46	55.0	50.77	12.1	28.98	70.9
Mar. 1.3	37.50 44	83.7 2	25.30 16	54.8 2	50.61 16	11.7 4	28.80 18	70.9 0
11.2	37.05 45	83.5 2	25.13 17	54.6 2	50.45 16	11.5 2	28.61 19	70.6 3
21.2	36.61 44	82.8 7	24.97 16	54.3 3	50.28 17	11.5 0	28.42 19	70.2 4
31.2	36.21 40 35	81.6 12 16	24.81 16 12	54.0 3 2	50.13 15 12	11.6 1 3	28.24 18 15	69.6 6 6
Apr. 10.2	35.86	80.0	24.69	53.8	50.01	11.9	28.09	69.0
20.1	35.59 27	78.1 19	24.59 10	53.6 2	49.91 10	12.3 4	27.98 11	68.2 8
30.1	35.41 18	76.0 21	24.54 5	53.4 2	49.85 6	13.0 7	27.91 7	67.4 8
May 10.1	35.32 9	73.8 22	24.52 2	53.4 0	49.82 3	13.8 8	27.89 2	66.6 8
20.0	35.34 2 12	71.4 24 23	24.56 4 8	53.4 0 2	49.85 3 6	14.7 9 11	27.93 4 8	65.9 7 7
30.0	35.46	69.1	24.64	53.6	49.91	15.8	28.01	65.2
June 9.0	35.68 22	66.8 23	24.77 13	53.9 3	50.02 11	17.1 13	28.15 14	64.6 6
19.0	36.00 32	64.7 21	24.94 17	54.3 4	50.17 15	18.4 13	28.34 19	64.2 4
28.9	36.41 41	62.7 20	25.15 21	54.9 6	50.36 19	19.9 15	28.56 22	63.9 3
July 8.9	36.90 49 55	61.1 16 14	25.39 24 27	55.5 6 7	50.58 22 25	21.3 14 14	28.83 27 30	63.8 1 0
18.9	37.45	59.7	25.66	56.2	50.83	22.7	29.13	63.8
28.8	38.06 61	58.6 11	25.95 29	57.0 8	51.10 27	24.1 14	29.45 32	63.9 1
Aug. 7.8	38.70 64	57.9 7	26.25 30	57.8 8	51.38 28	25.4 13	29.79 34	64.2 3
17.8	39.38 68	57.6 3	26.57 32	58.6 8	51.67 29	26.5 11	30.14 35	64.6 4
27.8	40.07 69 69	57.6 0 3	26.89 32 32	59.3 7 6	51.97 30 30	27.4 9 7	30.50 36 36	65.0 4 6
Sept. 6.7	40.76	57.9	27.21	59.9	52.27	28.1	30.86	65.6
16.7	41.46 70	58.6 7	27.53 32	60.5 6	52.57 30	28.6 5	31.22 36	66.2 6
26.7	42.13 67	59.7 11	27.84 31	60.9 4	52.85 28	28.7 1	31.57 35	66.8 6
Oct. 6.7	42.78 65	61.1 14	28.14 30	61.3 4	53.13 28	28.6 1	31.91 34	67.5 7
16.6	43.40 62 57	62.7 16 19	28.42 28 26	61.5 2 1	53.40 27 24	28.2 4 6	32.23 32 30	68.1 6 7
26.6	43.97	64.6	28.68	61.6	53.64	27.6	32.53	68.8
Nov. 5.6	44.48 51	66.8 22	28.92 24	61.6 0	53.87 23	26.8 8	32.81 28	69.5 7
15.5	44.92 44	69.1 23	29.14 22	61.5 1	54.07 20	25.8 10	33.06 25	70.2 7
25.5	45.29 37	71.6 25	29.32 18	61.4 1	54.24 17	24.7 11	33.27 21	70.9 7
Dec. 5.5	45.56 27 18	74.2 26 26	29.47 15 12	61.3 1 2	54.38 14 10	23.5 12 12	33.45 18 13	71.6 7 8
15.5	45.74 8	76.8	29.59	61.1	54.48	22.3	33.58	72.4
25.4	45.82 3	79.3 25	29.66 7	60.9 2	54.54 6	21.2 11	33.66 8	73.1 7
35.4	45.79 3	81.6 23	29.69 3	60.8 1	54.56 2	20.1 11	33.69 3	73.7 6
Sec δ, Tan δ	2.478	+2.268	1.056	+0.338	1.001	+0.040	1.193	+0.650
Mean Place	35°.540	59''.49	23°.095	46''.04	49°.380	8''.72	27°.348	57''.14
D'ψ a, Dω a	+0.06	-0.05	+0.01	-0.01	0.00	0.00	+0.02	-0.01
Dψ δ, Dω δ	+0.1	+0.9	+0.1	+0.9	+0.1	+1.0	+0.1	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Camelop. Mag. 4.2		$\epsilon$ Aurigæ. Var. 3.0-4.5		$\zeta$ Aurigæ. Mag. 3.9		$\iota$ Tauri. Mag. 4.7	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 4 55 s	° ' " +60 19 "	h m 4 55 s	° ' " +43 41 "	h m 4 56 s	° ' " +40 57 "	h m 4 58 s	° ' " +21 28 "
Jan. 0.4	54.24	24.9	54.37	68.1	34.30	23.1	2.76	19.7
10.4	54.20 <sup>4</sup>	26.9 <sup>20</sup>	54.37 <sup>0</sup>	69.3 <sup>12</sup>	34.30 <sup>0</sup>	24.2 <sup>11</sup>	2.78 <sup>2</sup>	19.7 <sup>0</sup>
20.4	54.08 <sup>12</sup>	28.7 <sup>18</sup>	54.31 <sup>6</sup>	70.4 <sup>11</sup>	34.25 <sup>5</sup>	25.2 <sup>10</sup>	2.74 <sup>4</sup>	19.7 <sup>0</sup>
30.3	53.89 <sup>19</sup>	30.2 <sup>15</sup>	54.20 <sup>11</sup>	71.2 <sup>8</sup>	34.15 <sup>10</sup>	25.9 <sup>7</sup>	2.66 <sup>8</sup>	19.6 <sup>1</sup>
Feb. 9.3	53.63 <sup>26</sup>	31.4 <sup>12</sup>	54.04 <sup>16</sup>	71.9 <sup>7</sup>	34.00 <sup>15</sup>	26.5 <sup>6</sup>	2.55 <sup>11</sup>	19.6 <sup>0</sup>
	31	7	19	3	19	3	14	1
19.3	53.32	32.1	53.85	72.2	33.81	26.8	2.41	19.5
Mar. 1.3	52.97 <sup>35</sup>	32.4 <sup>3</sup>	53.63 <sup>22</sup>	72.3 <sup>1</sup>	33.60 <sup>21</sup>	26.9 <sup>1</sup>	2.24 <sup>17</sup>	19.3 <sup>2</sup>
	36	1	23	1	21	2	17	2
11.2	52.61 <sup>36</sup>	32.3 <sup>6</sup>	53.40 <sup>23</sup>	72.2 <sup>1</sup>	33.39 <sup>21</sup>	26.7 <sup>2</sup>	2.07 <sup>17</sup>	19.1 <sup>2</sup>
21.2	52.26 <sup>35</sup>	31.7 <sup>10</sup>	53.17 <sup>23</sup>	71.7 <sup>5</sup>	33.17 <sup>22</sup>	26.2 <sup>5</sup>	1.90 <sup>17</sup>	18.8 <sup>3</sup>
31.2	51.93 <sup>33</sup>	30.7 <sup>13</sup>	52.96 <sup>21</sup>	70.9 <sup>8</sup>	32.97 <sup>20</sup>	25.5 <sup>7</sup>	1.74 <sup>16</sup>	18.5 <sup>3</sup>
	28	13	18	9	17	9	14	3
Apr. 10.2	51.65	29.4	52.78	70.0	32.80	24.6	1.60	18.2
20.1	51.42 <sup>23</sup>	27.7 <sup>17</sup>	52.64 <sup>14</sup>	68.9 <sup>11</sup>	32.67 <sup>13</sup>	23.6 <sup>10</sup>	1.50 <sup>10</sup>	17.9 <sup>3</sup>
30.1	51.27 <sup>15</sup>	25.9 <sup>18</sup>	52.55 <sup>9</sup>	67.6 <sup>13</sup>	32.58 <sup>9</sup>	22.5 <sup>11</sup>	1.43 <sup>7</sup>	17.7 <sup>2</sup>
May 10.1	51.20 <sup>7</sup>	23.9 <sup>20</sup>	52.52 <sup>3</sup>	66.3 <sup>13</sup>	32.55 <sup>3</sup>	21.3 <sup>12</sup>	1.41 <sup>2</sup>	17.5 <sup>2</sup>
20.0	51.21 <sup>1</sup>	21.8 <sup>21</sup>	52.55 <sup>3</sup>	65.0 <sup>13</sup>	32.58 <sup>3</sup>	20.2 <sup>11</sup>	1.44 <sup>3</sup>	17.4 <sup>1</sup>
	9	21	9	13	9	11	7	1
30.0	51.30	19.7	52.64	63.7	32.67	19.1	1.51	17.3
June 9.0	51.48 <sup>18</sup>	17.6 <sup>21</sup>	52.78 <sup>14</sup>	62.5 <sup>12</sup>	32.81 <sup>14</sup>	18.0 <sup>11</sup>	1.63 <sup>12</sup>	17.4 <sup>1</sup>
	26	19	20	10	19	9	16	3
19.0	51.74	15.7	52.98	61.5	33.00	17.1	1.79	17.7
28.9	52.07 <sup>33</sup>	14.0 <sup>17</sup>	53.23 <sup>25</sup>	60.6 <sup>9</sup>	33.24 <sup>24</sup>	16.4 <sup>7</sup>	1.99 <sup>20</sup>	18.0 <sup>3</sup>
July 8.9	52.47 <sup>40</sup>	12.5 <sup>15</sup>	53.53 <sup>30</sup>	59.9 <sup>7</sup>	33.53 <sup>29</sup>	15.8 <sup>6</sup>	2.23 <sup>24</sup>	18.4 <sup>4</sup>
	45	13	33	6	32	4	27	5
18.9	52.92	11.2	53.86	59.3	33.85	15.4	2.50	18.9
28.9	53.42 <sup>50</sup>	10.2 <sup>10</sup>	54.23 <sup>37</sup>	59.0 <sup>3</sup>	34.20 <sup>35</sup>	15.1 <sup>3</sup>	2.79 <sup>29</sup>	19.5 <sup>6</sup>
Aug. 7.8	53.95 <sup>53</sup>	9.6 <sup>6</sup>	54.61 <sup>38</sup>	58.9 <sup>1</sup>	34.57 <sup>37</sup>	15.1 <sup>0</sup>	3.09 <sup>30</sup>	20.2 <sup>7</sup>
	56	4	40	0	38	1	32	6
17.8	54.51 <sup>56</sup>	9.2 <sup>4</sup>	55.01 <sup>40</sup>	58.9 <sup>0</sup>	34.95 <sup>38</sup>	15.2 <sup>1</sup>	3.41 <sup>32</sup>	20.8 <sup>6</sup>
27.8	55.08 <sup>57</sup>	9.2 <sup>0</sup>	55.42 <sup>41</sup>	59.2 <sup>3</sup>	35.35 <sup>40</sup>	15.5 <sup>3</sup>	3.74 <sup>33</sup>	21.4 <sup>6</sup>
	58	2	41	4	39	4	32	5
Sept. 6.7	55.66	9.4	55.83	59.6	35.74	15.9	4.06	21.9
16.7	56.24 <sup>58</sup>	10.0 <sup>6</sup>	56.24 <sup>41</sup>	60.2 <sup>6</sup>	36.14 <sup>40</sup>	16.5 <sup>6</sup>	4.39 <sup>33</sup>	22.4 <sup>5</sup>
26.7	56.81 <sup>57</sup>	10.8 <sup>8</sup>	56.64 <sup>40</sup>	60.9 <sup>7</sup>	36.52 <sup>38</sup>	17.1 <sup>6</sup>	4.70 <sup>31</sup>	22.8 <sup>4</sup>
Oct. 6.7	57.36 <sup>55</sup>	11.9 <sup>11</sup>	57.03 <sup>39</sup>	61.7 <sup>8</sup>	36.90 <sup>38</sup>	17.9 <sup>8</sup>	5.01 <sup>31</sup>	23.2 <sup>4</sup>
16.6	57.88 <sup>52</sup>	13.3 <sup>14</sup>	57.40 <sup>37</sup>	62.6 <sup>9</sup>	37.26 <sup>36</sup>	18.8 <sup>9</sup>	5.30 <sup>29</sup>	23.4 <sup>2</sup>
	48	16	35	11	33	9	28	1
26.6	58.36	14.9	57.75	63.7	37.59	19.7	5.58	23.5
Nov. 5.6	58.81 <sup>45</sup>	16.8 <sup>19</sup>	58.07 <sup>32</sup>	64.8 <sup>11</sup>	37.90 <sup>31</sup>	20.7 <sup>10</sup>	5.84 <sup>26</sup>	23.6 <sup>1</sup>
	39	20	29	13	28	11	23	0
15.6	59.20 <sup>39</sup>	18.8 <sup>20</sup>	58.36 <sup>29</sup>	66.1 <sup>13</sup>	38.18 <sup>28</sup>	21.8 <sup>11</sup>	6.07 <sup>23</sup>	23.6 <sup>0</sup>
25.5	59.53 <sup>33</sup>	20.9 <sup>21</sup>	58.61 <sup>25</sup>	67.4 <sup>13</sup>	38.42 <sup>24</sup>	23.0 <sup>12</sup>	6.27 <sup>20</sup>	23.6 <sup>0</sup>
Dec. 5.5	59.79 <sup>26</sup>	23.2 <sup>23</sup>	58.81 <sup>20</sup>	68.7 <sup>13</sup>	38.62 <sup>20</sup>	24.2 <sup>12</sup>	6.43 <sup>16</sup>	23.6 <sup>0</sup>
	18	22	15	14	14	11	13	0
15.5	59.97	25.4	58.96	70.1	38.76	25.3	6.56	23.6
25.4	60.07 <sup>10</sup>	27.6 <sup>22</sup>	59.05 <sup>9</sup>	71.4 <sup>13</sup>	38.86 <sup>10</sup>	26.5 <sup>12</sup>	6.64 <sup>8</sup>	23.6 <sup>0</sup>
35.4	60.09 <sup>2</sup>	29.8 <sup>22</sup>	59.09 <sup>4</sup>	72.6 <sup>12</sup>	38.89 <sup>3</sup>	27.6 <sup>11</sup>	6.68 <sup>4</sup>	23.5 <sup>1</sup>
Sec $\delta$ , Tan $\delta$	2.020	+1.755	1.383	+0.956	1.324	+0.868	1.075	+0.393
Mean Place	51 <sup>s</sup> .023	10 <sup>''</sup> .05	52 <sup>s</sup> .017	55 <sup>''</sup> .08	32 <sup>s</sup> .023	10 <sup>''</sup> .53	0 <sup>s</sup> .837	9 <sup>''</sup> .83
$D\alpha$ , $D_{\alpha}$	+0.05	-0.03	+0.02	-0.02	+0.02	-0.02	+0.01	-0.01
$D\delta$ , $D_{\delta}$	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	11 Orionis. Mag. 4.6		17 Aurigæ. Mag. 3.3		ε Leporis. Mag. 3.3		β Eridani. Mag. 2.0	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 4 59 s	° ' " +15 17 "	h m 5 0 s	° ' " +41 7 "	h m 5 1 s	° ' " -22 28 "	h m 5 3 s	° ' " - 5 11 "
Jan. 0.4	44.52	20.9	35.42	26.6	53.59	60.5	42.05	37.7
10.4	44.53 <sup>1</sup>	20.5 <sup>4</sup>	35.43 <sup>1</sup>	27.7 <sup>11</sup>	53.57 <sup>2</sup>	62.7 <sup>22</sup>	42.05 <sup>0</sup>	39.1 <sup>14</sup>
20.4	44.50 <sup>3</sup>	20.2 <sup>3</sup>	35.38 <sup>5</sup>	28.6 <sup>9</sup>	53.50 <sup>7</sup>	64.6 <sup>19</sup>	42.01 <sup>4</sup>	40.4 <sup>13</sup>
30.4	44.43 <sup>7</sup>	19.9 <sup>3</sup>	35.28 <sup>10</sup>	29.4 <sup>8</sup>	53.39 <sup>11</sup>	66.2 <sup>16</sup>	41.93 <sup>8</sup>	41.5 <sup>11</sup>
Feb. 9.3	44.32 <sup>11</sup>	19.7 <sup>2</sup>	35.13 <sup>15</sup>	30.0 <sup>6</sup>	53.25 <sup>14</sup>	67.4 <sup>12</sup>	41.82 <sup>11</sup>	42.3 <sup>8</sup>
	14 <sup>3</sup>		18 <sup>3</sup>	4 <sup>4</sup>	17 <sup>9</sup>		15 <sup>7</sup>	
19.3	44.18	19.4 <sup>2</sup>	34.95	30.4 <sup>1</sup>	53.08	68.3 <sup>5</sup>	41.67 <sup>16</sup>	43.0 <sup>4</sup>
Mar. 1.3	44.02 <sup>16</sup>	19.2 <sup>2</sup>	34.74 <sup>21</sup>	30.5 <sup>1</sup>	52.89 <sup>19</sup>	68.8 <sup>2</sup>	41.51 <sup>17</sup>	43.4 <sup>2</sup>
11.2	43.85 <sup>17</sup>	19.0 <sup>2</sup>	34.52 <sup>22</sup>	30.3 <sup>2</sup>	52.69 <sup>20</sup>	69.0 <sup>2</sup>	41.34 <sup>17</sup>	43.6 <sup>0</sup>
21.2	43.69 <sup>16</sup>	18.8 <sup>2</sup>	34.30 <sup>22</sup>	29.9 <sup>4</sup>	52.50 <sup>19</sup>	68.8 <sup>2</sup>	41.17 <sup>17</sup>	43.6 <sup>0</sup>
31.2	43.53 <sup>16</sup>	18.6 <sup>2</sup>	34.10 <sup>20</sup>	29.2 <sup>7</sup>	52.31 <sup>19</sup>	68.2 <sup>6</sup>	41.01 <sup>16</sup>	43.3 <sup>3</sup>
	13 <sup>1</sup>		17 <sup>5</sup>	8 <sup>8</sup>	17 <sup>9</sup>		14 <sup>5</sup>	
Apr. 10.2	43.40	18.5 <sup>0</sup>	33.93	28.4 <sup>10</sup>	52.14	67.3 <sup>13</sup>	40.87 <sup>11</sup>	42.8 <sup>7</sup>
20.1	43.30 <sup>10</sup>	18.5 <sup>0</sup>	33.79 <sup>14</sup>	27.4 <sup>10</sup>	52.01 <sup>13</sup>	66.0 <sup>13</sup>	40.76 <sup>11</sup>	42.1 <sup>7</sup>
30.1	43.23 <sup>7</sup>	18.5 <sup>0</sup>	33.70 <sup>9</sup>	26.3 <sup>11</sup>	51.91 <sup>10</sup>	64.4 <sup>16</sup>	40.68 <sup>8</sup>	41.2 <sup>9</sup>
May 10.1	43.21 <sup>2</sup>	18.6 <sup>1</sup>	33.67 <sup>3</sup>	25.1 <sup>12</sup>	51.85 <sup>6</sup>	62.5 <sup>19</sup>	40.64 <sup>4</sup>	40.1 <sup>11</sup>
20.1	43.23 <sup>2</sup>	18.8 <sup>2</sup>	33.69 <sup>2</sup>	23.9 <sup>12</sup>	51.83 <sup>2</sup>	60.4 <sup>21</sup>	40.65 <sup>1</sup>	38.8 <sup>13</sup>
	7 <sup>4</sup>		8 <sup>15</sup>	11 <sup>15</sup>	3 <sup>23</sup>		5 <sup>15</sup>	
30.0	43.30	19.2 <sup>4</sup>	33.77	22.8 <sup>11</sup>	51.86 <sup>8</sup>	58.1 <sup>24</sup>	40.70 <sup>9</sup>	37.3 <sup>16</sup>
June 9.0	43.41 <sup>11</sup>	19.6 <sup>4</sup>	33.91 <sup>14</sup>	21.7 <sup>11</sup>	51.94 <sup>12</sup>	55.7 <sup>25</sup>	40.79 <sup>13</sup>	35.7 <sup>17</sup>
19.0	43.56 <sup>15</sup>	20.2 <sup>6</sup>	34.10 <sup>19</sup>	20.8 <sup>9</sup>	52.06 <sup>16</sup>	53.2 <sup>25</sup>	40.92 <sup>17</sup>	34.0 <sup>17</sup>
28.9	43.75 <sup>19</sup>	20.9 <sup>7</sup>	34.34 <sup>24</sup>	20.0 <sup>8</sup>	52.22 <sup>16</sup>	50.7 <sup>25</sup>	41.09 <sup>17</sup>	32.3 <sup>17</sup>
July 8.9	43.98 <sup>23</sup>	21.6 <sup>7</sup>	34.62 <sup>28</sup>	19.4 <sup>6</sup>	52.41 <sup>19</sup>	48.2 <sup>25</sup>	41.29 <sup>20</sup>	30.5 <sup>18</sup>
	25 <sup>9</sup>		32 <sup>17</sup>	5 <sup>5</sup>	23 <sup>24</sup>		23 <sup>17</sup>	
18.9	44.23	22.5 <sup>8</sup>	34.94	18.9 <sup>3</sup>	52.64	45.8 <sup>22</sup>	41.52 <sup>25</sup>	28.8 <sup>16</sup>
28.9	44.51 <sup>28</sup>	23.3 <sup>8</sup>	35.29 <sup>35</sup>	18.6 <sup>1</sup>	52.89 <sup>25</sup>	43.6 <sup>19</sup>	41.77 <sup>27</sup>	27.2 <sup>15</sup>
Aug. 7.8	44.80 <sup>29</sup>	24.1 <sup>8</sup>	35.66 <sup>37</sup>	18.5 <sup>1</sup>	53.17 <sup>28</sup>	41.7 <sup>15</sup>	42.04 <sup>29</sup>	25.7 <sup>12</sup>
17.8	45.11 <sup>31</sup>	24.9 <sup>8</sup>	36.04 <sup>38</sup>	18.6 <sup>1</sup>	53.46 <sup>29</sup>	40.2 <sup>12</sup>	42.33 <sup>29</sup>	24.5 <sup>10</sup>
27.8	45.42 <sup>31</sup>	25.6 <sup>7</sup>	36.43 <sup>39</sup>	18.9 <sup>3</sup>	53.76 <sup>30</sup>	39.0 <sup>8</sup>	42.62 <sup>29</sup>	23.5 <sup>7</sup>
	31 <sup>6</sup>		40 <sup>7</sup>	3 <sup>3</sup>	31 <sup>8</sup>		30 <sup>7</sup>	
Sept. 6.7	45.73	26.2 <sup>4</sup>	36.83	19.2 <sup>5</sup>	54.07	38.2 <sup>3</sup>	42.92 <sup>29</sup>	22.8 <sup>4</sup>
16.7	46.05 <sup>32</sup>	26.6 <sup>4</sup>	37.22 <sup>39</sup>	19.7 <sup>6</sup>	54.37 <sup>30</sup>	37.9 <sup>3</sup>	43.21 <sup>29</sup>	22.4 <sup>0</sup>
26.7	46.35 <sup>30</sup>	27.0 <sup>4</sup>	37.61 <sup>39</sup>	20.3 <sup>7</sup>	54.67 <sup>30</sup>	38.2 <sup>7</sup>	43.50 <sup>28</sup>	22.4 <sup>3</sup>
Oct. 6.7	46.65 <sup>30</sup>	27.1 <sup>1</sup>	37.99 <sup>38</sup>	21.0 <sup>9</sup>	54.95 <sup>28</sup>	38.9 <sup>11</sup>	43.78 <sup>27</sup>	23.4 <sup>9</sup>
16.6	46.93 <sup>28</sup>	27.1 <sup>0</sup>	38.35 <sup>36</sup>	21.9 <sup>9</sup>	55.22 <sup>27</sup>	40.0 <sup>16</sup>	44.05 <sup>27</sup>	
	27 <sup>1</sup>		34 <sup>1</sup>	9 <sup>9</sup>	26 <sup>16</sup>		25 <sup>1</sup>	
26.6	47.20	27.0 <sup>2</sup>	38.69	22.8 <sup>10</sup>	55.48	41.6 <sup>19</sup>	44.30 <sup>23</sup>	24.3 <sup>12</sup>
Nov. 5.6	47.45 <sup>25</sup>	26.8 <sup>3</sup>	39.01 <sup>32</sup>	23.8 <sup>10</sup>	55.70 <sup>22</sup>	43.5 <sup>22</sup>	44.53 <sup>21</sup>	25.5 <sup>14</sup>
15.6	47.67 <sup>22</sup>	26.5 <sup>4</sup>	39.29 <sup>28</sup>	24.8 <sup>12</sup>	55.90 <sup>20</sup>	45.7 <sup>24</sup>	44.74 <sup>17</sup>	26.9 <sup>16</sup>
25.5	47.87 <sup>20</sup>	26.1 <sup>5</sup>	39.53 <sup>24</sup>	26.0 <sup>11</sup>	56.07 <sup>17</sup>	48.1 <sup>25</sup>	44.91 <sup>15</sup>	28.5 <sup>17</sup>
Dec. 5.5	48.03 <sup>16</sup>	25.6 <sup>4</sup>	39.74 <sup>21</sup>	27.1 <sup>12</sup>	56.20 <sup>13</sup>	50.6 <sup>25</sup>	45.06 <sup>11</sup>	30.2 <sup>16</sup>
	12 <sup>4</sup>		15 <sup>4</sup>	12 <sup>11</sup>	9 <sup>25</sup>		11 <sup>16</sup>	
15.5	48.15	25.2 <sup>4</sup>	39.89	28.3 <sup>12</sup>	56.29	53.1 <sup>25</sup>	45.17 <sup>6</sup>	31.8 <sup>16</sup>
25.4	48.23 <sup>8</sup>	24.8 <sup>4</sup>	39.99 <sup>10</sup>	29.5 <sup>11</sup>	56.34 <sup>5</sup>	55.6 <sup>23</sup>	45.23 <sup>3</sup>	33.4 <sup>15</sup>
35.4	48.27 <sup>4</sup>	24.4 <sup>4</sup>	40.03 <sup>4</sup>	30.6 <sup>11</sup>	56.34 <sup>0</sup>	57.9 <sup>23</sup>	45.26 <sup>3</sup>	
Sec δ, Tan δ	1.037	+0.273	1.328	+0.873	1.082	-0.414	1.004	-0.091
Mean Place	42°.650	11''.96	33°.117	14''.19	51°.735	64''.16	40°.249	43''.62
D'ψ α, Dω α	+0.01	0.00	+0.02	-0.02	-0.01	+0.01	0.00	0.00
Dψ δ, Dω δ	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Aurigæ. Mag. 4.8		19 H. Camelop. Mag. 5.2		$\mu$ Leporis. Mag. 3.3		$\alpha$ Aurigæ. (Capella.) Mag. 0.2	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 5 7	° ' + 38 23	h m 5 8	° ' + 79 8	h m 5 9	° ' - 16 17	h m 5 10	° ' + 45 54
	s	"	s	"	s	"	s	"
Jan. 0.4	38.80	17.2	39.43	25.1	8.61	74.7	26.96	58.2
10.4	38.82 2	18.2 10	39.24 19	28.0 29	8.60 1	76.7 20	26.98 2	59.6 14
20.4	38.78 4	19.0 8	38.82 42	30.6 26	8.55 5	78.4 17	26.93 5	60.8 12
30.4	38.69 9	19.7 7	38.21 61	32.8 22	8.46 9	79.8 14	26.82 11	61.8 10
Feb. 9.3	38.56 13	20.3 6	37.43 78	34.5 17	8.33 13	81.0 12	26.67 15	62.6 8
	17	3	91	13	16	9	20	5
19.3	38.39	20.6	36.52	35.8	8.17	81.9	26.47	63.1
Mar. 1.3	38.19 20	20.7 1	35.52 100	36.5 7	8.00 17	82.4 5	26.25 22	63.4 3
11.2	37.98 21	20.6 1	34.48 104	36.6 1	7.82 18	82.6 2	26.01 24	63.3 1
21.2	37.77 21	20.2 4	33.45 103	36.2 4	7.63 19	82.5 1	25.77 24	62.9 4
31.2	37.57 20	19.7 5	32.48 97	35.2 10	7.45 18	82.1 4	25.54 23	62.3 6
	17	7	87	15	15	8	20	9
Apr. 10.2	37.40	19.0	31.61	33.7	7.30	81.3	25.34	61.4
20.1	37.27 13	18.1 9	30.88 73	31.7 20	7.17 13	80.3 10	25.18 16	60.3 11
30.1	37.18 9	17.1 10	30.32 56	29.4 23	7.07 10	79.0 13	25.08 10	59.0 13
May 10.1	37.14 4	16.1 10	29.95 37	26.9 25	7.02 5	77.4 16	25.02 6	57.6 14
20.1	37.16 2	15.0 11	29.78 17	24.1 28	7.00 2	75.6 18	25.03 1	56.2 14
	7	10	5	28	3	20	7	14
30.0	37.23	14.0	29.83	21.3	7.03	73.6	25.10	54.8
June 9.0	37.35 12	13.1 9	30.09 26	18.5 28	7.11 8	71.5 21	25.23 13	53.5 13
19.0	37.53 18	12.3 8	30.55 46	15.8 27	7.23 12	69.3 22	25.42 19	52.2 13
28.9	37.75 22	11.6 7	31.21 66	13.2 26	7.38 15	67.0 23	25.66 24	51.1 11
July 8.9	38.02 27	11.1 5	32.05 84	10.9 23	7.58 20	64.8 22	25.95 29	50.1 10
	30	4	99	21	22	22	33	7
18.9	38.32	10.7	33.04	8.8	7.80	62.6	26.28	49.4
28.9	38.65 33	10.5 2	34.17 113	7.1 17	8.05 25	60.6 20	26.64 36	48.8 6
Aug. 7.8	39.00 35	10.5 0	35.41 124	5.7 14	8.32 27	58.8 18	27.03 39	48.4 4
17.8	39.37 37	10.6 1	36.73 132	4.8 9	8.60 28	57.3 15	27.44 41	48.2 2
27.8	39.75 38	10.8 2	38.11 138	4.2 6	8.89 29	56.2 11	27.86 42	48.2 0
	38	3	142	1	30	8	42	2
Sept. 6.8	40.13	11.1	39.53	4.1	9.19	55.4	28.28	48.4
16.7	40.51 38	11.5 4	40.96 143	4.4 3	9.49 30	55.1 3	28.71 43	48.8 4
26.7	40.89 38	12.0 5	42.38 142	5.1 7	9.78 29	55.2 1	29.13 42	49.3 5
Oct. 6.7	41.26 37	12.6 6	43.76 138	6.3 12	10.07 29	55.8 6	29.54 41	50.0 7
16.6	41.61 35	13.2 6	45.07 131	7.8 15	10.34 27	56.8 10	29.94 40	50.8 8
	33	8	122	19	25	13	37	10
26.6	41.94	14.0	46.29	9.7	10.59	58.1	30.31	51.8
Nov. 5.6	42.25 31	14.8 8	47.39 110	12.0 23	10.82 23	59.8 17	30.66 35	52.9 11
15.6	42.53 28	15.7 9	48.35 96	14.5 25	11.03 21	61.7 19	30.97 31	54.1 12
25.5	42.78 25	16.6 9	49.14 79	17.3 28	11.21 18	63.8 21	31.25 28	55.5 14
Dec. 5.5	42.98 20	17.5 9	49.74 60	20.3 30	11.35 14	66.1 23	31.47 22	56.9 14
	16	10	38	30	10	22	18	14
15.5	43.14	18.5	50.12	23.3	11.45	68.3	31.65	58.3
25.5	43.24 10	19.5 10	50.29 17	26.3 30	11.51 6	70.5 22	31.76 11	59.7 14
35.4	43.30 6	20.5 10	50.23 6	29.3 30	11.53 2	72.6 21	31.81 5	61.1 14
Sec $\delta$ , Tan $\delta$	1.276	+0.792	5.307	+5.212	1.042	-0.292	1.437	+1.032
Mean Place	36°.538	5''.59	31°.512	10''.01	6°.773	79''.23	24°.448	45''.93
D $\phi$ $\alpha$ , D $\omega$ $\alpha$	+0.02	-0.01	+0.13	-0.08	-0.01	0.00	+0.03	-0.01
D $\phi$ $\delta$ , D $\omega$ $\delta$	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Orionis. (Rigel.) Mag. 0.3		$\lambda$ Aurigæ. Mag. 4.8		$\tau$ Orionis. Mag. 3.7		O Colum Mag. 4	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	
	h m 5 10 s	° ' " — 8 17 "	h m 5 13 s	° ' " +40 1 "	h m 5 13 s	° ' " — 6 55 "	h m 5 14 s	
Jan. 0.4	28.94	51.0	11.92	40.3	30.55	61.9	26.99	
10.4	28.95 <sup>1</sup>	52.6 <sup>16</sup>	11.94 <sup>2</sup>	41.3 <sup>10</sup>	30.56 <sup>1</sup>	63.4 <sup>15</sup>	26.95 <sup>4</sup>	
20.4	28.91 <sup>4</sup>	54.0 <sup>14</sup>	11.91 <sup>3</sup>	42.3 <sup>10</sup>	30.52 <sup>4</sup>	64.8 <sup>14</sup>	26.86 <sup>9</sup>	
30.4	28.83 <sup>8</sup>	55.2 <sup>12</sup>	11.82 <sup>9</sup>	43.1 <sup>8</sup>	30.44 <sup>8</sup>	65.9 <sup>11</sup>	26.72 <sup>14</sup>	
Feb. 9.3	28.71 <sup>12</sup>	56.1 <sup>9</sup>	11.69 <sup>13</sup>	43.7 <sup>6</sup>	30.33 <sup>11</sup>	66.9 <sup>10</sup>	26.55 <sup>17</sup>	
	<sup>14</sup>	<sup>8</sup>	<sup>17</sup>	<sup>4</sup>	<sup>14</sup>	<sup>7</sup>	<sup>21</sup>	
19.3	28.57	56.9	11.52	44.1	30.19	67.6	26.34	
Mar. 1.3	28.41 <sup>16</sup>	57.4 <sup>5</sup>	11.32 <sup>20</sup>	44.2 <sup>1</sup>	30.03 <sup>16</sup>	68.0 <sup>4</sup>	26.11 <sup>23</sup>	
11.2	28.24 <sup>17</sup>	57.6 <sup>2</sup>	11.11 <sup>21</sup>	44.1 <sup>1</sup>	29.86 <sup>17</sup>	68.3 <sup>3</sup>	25.87 <sup>24</sup>	
21.2	28.06 <sup>18</sup>	57.5 <sup>1</sup>	10.89 <sup>22</sup>	43.8 <sup>3</sup>	29.69 <sup>17</sup>	68.3 <sup>0</sup>	25.63 <sup>24</sup>	
31.2	27.90 <sup>16</sup>	57.2 <sup>3</sup>	10.69 <sup>20</sup>	43.3 <sup>5</sup>	29.52 <sup>17</sup>	68.0 <sup>3</sup>	25.40 <sup>23</sup>	
	<sup>15</sup>	<sup>5</sup>	<sup>18</sup>	<sup>8</sup>	<sup>15</sup>	<sup>5</sup>	<sup>21</sup>	
Apr. 10.2	27.75	56.7	10.51	42.5	29.37	67.5	25.19	
20.1	27.63 <sup>12</sup>	55.9 <sup>8</sup>	10.37 <sup>14</sup>	41.6 <sup>9</sup>	29.25 <sup>12</sup>	66.8 <sup>7</sup>	25.01 <sup>18</sup>	
30.1	27.54 <sup>9</sup>	54.9 <sup>10</sup>	10.27 <sup>10</sup>	40.5 <sup>11</sup>	29.17 <sup>8</sup>	65.9 <sup>9</sup>	24.87 <sup>14</sup>	
May 10.1	27.50 <sup>4</sup>	53.7 <sup>12</sup>	10.23 <sup>4</sup>	39.4 <sup>11</sup>	29.12 <sup>5</sup>	64.7 <sup>12</sup>	24.77 <sup>10</sup>	
20.1	27.49 <sup>1</sup>	52.2 <sup>15</sup>	10.24 <sup>1</sup>	38.3 <sup>11</sup>	29.11 <sup>1</sup>	63.4 <sup>13</sup>	24.72 <sup>5</sup>	
	<sup>4</sup>	<sup>16</sup>	<sup>6</sup>	<sup>11</sup>	<sup>4</sup>	<sup>16</sup>	<sup>1</sup>	
30.0	27.53	50.6	10.30	37.2	29.15	61.8	24.71	
June 9.0	27.61 <sup>8</sup>	48.9 <sup>17</sup>	10.42 <sup>12</sup>	36.2 <sup>10</sup>	29.23 <sup>8</sup>	60.2 <sup>16</sup>	24.76 <sup>5</sup>	
19.0	27.73 <sup>12</sup>	47.0 <sup>19</sup>	10.60 <sup>18</sup>	35.2 <sup>10</sup>	29.35 <sup>12</sup>	58.4 <sup>18</sup>	24.85 <sup>9</sup>	
28.9	27.89 <sup>16</sup>	45.2 <sup>18</sup>	10.83 <sup>23</sup>	34.4 <sup>8</sup>	29.51 <sup>16</sup>	56.6 <sup>18</sup>	24.99 <sup>14</sup>	
July 8.9	28.09 <sup>20</sup>	43.3 <sup>19</sup>	11.09 <sup>26</sup>	33.7 <sup>7</sup>	29.70 <sup>19</sup>	54.8 <sup>18</sup>	25.18 <sup>19</sup>	
	<sup>22</sup>	<sup>19</sup>	<sup>30</sup>	<sup>5</sup>	<sup>23</sup>	<sup>18</sup>	<sup>22</sup>	
18.9	28.31	41.4	11.39	33.2	29.93	53.0	25.40	
28.9	28.56 <sup>25</sup>	39.7 <sup>17</sup>	11.73 <sup>34</sup>	32.9 <sup>3</sup>	30.17 <sup>24</sup>	51.3 <sup>17</sup>	25.65 <sup>25</sup>	
Aug. 7.8	28.83 <sup>27</sup>	38.1 <sup>16</sup>	12.09 <sup>36</sup>	32.7 <sup>2</sup>	30.44 <sup>27</sup>	49.8 <sup>15</sup>	25.93 <sup>28</sup>	
17.8	29.11 <sup>28</sup>	36.8 <sup>13</sup>	12.46 <sup>37</sup>	32.6 <sup>1</sup>	30.72 <sup>28</sup>	48.5 <sup>13</sup>	26.23 <sup>30</sup>	
27.8	29.40 <sup>29</sup>	35.8 <sup>10</sup>	12.84 <sup>38</sup>	32.7 <sup>1</sup>	31.01 <sup>29</sup>	47.5 <sup>10</sup>	26.55 <sup>32</sup>	
	<sup>30</sup>	<sup>7</sup>	<sup>39</sup>	<sup>3</sup>	<sup>30</sup>	<sup>7</sup>	<sup>33</sup>	
Sept. 6.8	29.70	35.1	13.23	33.0	31.31	46.8	26.88	
16.7	29.99 <sup>29</sup>	34.7 <sup>4</sup>	13.63 <sup>40</sup>	33.3 <sup>3</sup>	31.60 <sup>29</sup>	46.5 <sup>3</sup>	27.20 <sup>32</sup>	
26.7	30.28 <sup>29</sup>	34.8 <sup>1</sup>	14.01 <sup>38</sup>	33.7 <sup>4</sup>	31.89 <sup>29</sup>	46.5 <sup>0</sup>	27.53 <sup>33</sup>	
Oct. 6.7	30.57 <sup>29</sup>	35.2 <sup>4</sup>	14.39 <sup>38</sup>	34.3 <sup>6</sup>	32.17 <sup>28</sup>	46.8 <sup>3</sup>	27.84 <sup>31</sup>	
16.6	30.84 <sup>27</sup>	35.9 <sup>7</sup>	14.76 <sup>37</sup>	34.9 <sup>6</sup>	32.45 <sup>28</sup>	47.5 <sup>7</sup>	28.14 <sup>30</sup>	
	<sup>25</sup>	<sup>10</sup>	<sup>35</sup>	<sup>8</sup>	<sup>25</sup>	<sup>11</sup>	<sup>28</sup>	
26.6	31.09	36.9	15.11	35.7	32.70	48.6	28.42	
Nov. 5.6	31.33 <sup>24</sup>	38.3 <sup>14</sup>	15.43 <sup>32</sup>	36.5 <sup>8</sup>	32.94 <sup>24</sup>	49.9 <sup>13</sup>	28.67 <sup>25</sup>	
15.6	31.54 <sup>21</sup>	39.9 <sup>16</sup>	15.72 <sup>29</sup>	37.4 <sup>9</sup>	33.16 <sup>22</sup>	51.4 <sup>15</sup>	28.88 <sup>21</sup>	
25.5	31.72 <sup>18</sup>	41.6 <sup>17</sup>	15.98 <sup>26</sup>	38.3 <sup>9</sup>	33.34 <sup>18</sup>	53.1 <sup>17</sup>	29.06 <sup>18</sup>	
Dec. 5.5	31.87 <sup>15</sup>	43.4 <sup>18</sup>	16.20 <sup>22</sup>	39.3 <sup>10</sup>	33.49 <sup>15</sup>	54.8 <sup>17</sup>	29.19 <sup>13</sup>	
	<sup>11</sup>	<sup>19</sup>	<sup>16</sup>	<sup>11</sup>	<sup>12</sup>	<sup>18</sup>	<sup>9</sup>	
15.5	31.98	45.3	16.36	40.4	33.61	56.6	29.28	
25.5	32.05 <sup>7</sup>	47.1 <sup>18</sup>	16.48 <sup>12</sup>	41.5 <sup>11</sup>	33.68 <sup>7</sup>	58.3 <sup>17</sup>	29.32 <sup>4</sup>	
35.4	32.08 <sup>3</sup>	48.8 <sup>17</sup>	16.54 <sup>6</sup>	42.5 <sup>10</sup>	33.72 <sup>4</sup>	60.0 <sup>17</sup>	29.31 <sup>1</sup>	
Sec $\delta$ , Tan $\delta$	1.011	−0.146	1.306	+0.840	1.007	−0.122	1.220	−
Mean Place	27 <sup>s</sup> .127	56 <sup>''</sup> .44	9 <sup>s</sup> .585	28 <sup>''</sup> .81	28 <sup>s</sup> .726	67 <sup>''</sup> .54	24 <sup>s</sup> .975	40 <sup>''</sup>
D $\psi$ $\alpha$ , D $\omega$ $\alpha$	0.00	0.00	+0.02	−0.01	0.00	0.00	−0.02	+1
D $\psi$ $\delta$ , D $\omega$ $\delta$	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0	+0.1	+1

FOR THE UPPER TRANSIT AT WASHINGTON.

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	χ Aurigæ. Mag. 4.9		δ Orionis. Mag. 2.5		Groombridge 968. Mag. 6.4		α Leporis. Mag. 2.7	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 5 27	° ' " + 32 7	h m 5 27	° ' " - 0 21	h m 5 28	° ' " + 74 59	h m 5 28	° ' " - 17 52
	s	"	s	"	s	"	s	"
Jan. 0.5	13.86	58.4	41.67	34.0	27.27	36.0	60.74	52.0
10.4	13.90 4	59.1 7	41.69 2	35.2 12	27.23 4	38.8 28	60.74 0	54.1 21
20.4	13.89 1	59.6 5	41.67 2	36.3 11	27.02 21	41.3 25	60.70 4	56.0 19
30.4	13.83 6	60.1 5	41.61 6	37.3 10	26.66 36	43.6 23	60.62 8	57.6 16
Feb. 9.3	13.72 11	60.5 4	41.51 10	38.1 8	26.16 50	45.4 18	60.50 12	59.0 14
	15	3	13	6	61	14	15	10
19.3	13.57	60.8	41.38	38.7	25.55	46.8	60.35	60.0
Mar. 1.3	13.40 17	61.0 2	41.23 15	39.1 4	24.86 69	47.7 9	60.18 17	60.7 7
11.3	13.21 19	61.0 0	41.07 16	39.4 3	24.13 73	48.1 4	59.99 19	61.0 3
21.2	13.01 20	60.8 2	40.90 17	39.4 0	23.39 74	47.9 2	59.80 19	61.0 0
31.2	12.83 18	60.4 4	40.74 16	39.3 1	22.68 71	47.1 8	59.62 18	60.7 3
	17	4	15	3	64	12	17	7
Apr. 10.2	12.66	60.0	40.59	39.0	22.04	45.9	59.45	60.0
20.2	12.52 14	59.4 6	40.47 12	38.6 4	21.48 56	44.2 17	59.31 14	59.1 9
30.1	12.43 9	58.8 6	40.38 9	37.9 7	21.04 44	42.2 20	59.19 12	57.8 13
May 10.1	12.38 5	58.1 7	40.32 6	37.1 8	20.73 31	39.9 23	59.12 7	56.3 15
20.1	12.37 1	57.4 7	40.31 1	36.1 10	20.57 16	37.3 26	59.09 3	54.5 18
	5	7	3	12	1	26	1	20
30.0	12.42	56.7	40.34	34.9	20.56	34.7	59.10	52.5
June 9.0	12.52 10	56.1 6	40.42 8	33.7 12	20.71 15	32.0 27	59.15 5	50.4 21
19.0	12.67 15	55.6 5	40.53 11	32.3 14	21.01 30	29.3 27	59.25 10	48.1 23
29.0	12.86 19	55.2 4	40.68 15	30.9 14	21.45 44	26.7 26	59.39 14	45.9 22
July 8.9	13.09 23	54.9 3	40.87 19	29.4 15	22.02 57	24.4 23	59.56 17	43.6 23
	26	2	21	14	70	22	21	22
18.9	13.35	54.7	41.08	28.0	22.72	22.2	59.77	41.4
28.9	13.65 30	54.6 1	41.32 24	26.6 14	23.52 80	20.4 18	60.00 23	39.4 20
Aug. 7.8	13.96 31	54.6 0	41.58 26	25.4 12	24.40 88	18.8 16	60.25 25	37.5 19
17.8	14.30 34	54.6 0	41.86 28	24.3 11	25.36 96	17.7 11	60.53 28	36.0 15
27.8	14.64 34	54.8 2	42.15 29	23.4 9	26.37 101	16.9 8	60.82 29	34.8 12
	35	2	29	6	104	4	29	8
Sept. 6.8	14.99	55.0	42.44	22.8	27.41	16.5	61.11	34.0
16.7	15.35 36	55.2 2	42.74 30	22.4 4	28.47 106	16.5 0	61.41 30	33.6 4
26.7	15.71 36	55.5 3	43.04 30	22.4 0	29.53 106	16.9 4	61.71 30	33.7 1
Oct. 6.7	16.06 35	55.8 3	43.33 29	22.6 2	30.57 104	17.7 8	62.00 29	34.2 5
16.7	16.40 34	56.1 3	43.61 28	23.2 6	31.57 100	18.9 12	62.28 28	35.1 9
	32	3	26	8	95	15	27	14
26.6	16.72	56.4	43.87	24.0	32.52	20.4	62.55	36.5
Nov. 5.6	17.03 31	56.8 4	44.12 25	25.0 10	33.40 88	22.3 19	62.80 25	38.2 17
15.6	17.31 28	57.2 4	44.35 23	26.3 13	34.18 78	24.5 22	63.03 23	40.2 20
25.5	17.56 25	57.6 4	44.56 21	27.6 13	34.84 66	27.0 25	63.22 19	42.5 23
Dec. 5.5	17.77 21	58.1 5	44.73 17	29.1 15	35.38 54	29.7 27	63.38 16	44.8 23
	17	6	13	14	38	28	12	24
15.5	17.94	58.7	44.86	30.5	35.76	32.5	63.50	47.2
25.5	18.07 13	59.3 6	44.96 10	32.0 15	35.99 23	35.3 28	63.58 8	49.6 24
35.4	18.14 7	59.8 5	45.01 5	33.3 13	36.05 6	38.1 28	63.61 3	51.8 22
Sec δ, Tan δ	1.181	+0.628	1.000	-0.006	3.862	+3.730	1.051	-0.323
Mean Place	11 <sup>m</sup> .663	48 <sup>''</sup> .64	39 <sup>m</sup> .809	40 <sup>''</sup> .31	21 <sup>m</sup> .045	22 <sup>''</sup> .90	58 <sup>m</sup> .865	56 <sup>''</sup> .65
D'ψ α, Dα α	+0.02	-0.01	0.00	0.00	+0.10	-0.03	-0.01	0.00
Dψ δ, Dα δ	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0	+0.1	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♂ Orionis. Mag. 4.5		ι Orionis. Mag. 2.9		ε Orionis. Mag. 1.8		ζ Tauri. Mag. 3.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 5 30 s	° ' " + 9 25 "	h m 5 31 s	° ' " - 5 57 "	h m 5 31 s	° ' " - 1 15 "	h m 5 32 s	° ' " + 21 5 "
Jan. 0.5	11.10	65.5	18.34	47.9	55.85	12.9	35.88	38.1
10.4	11.14 4	64.8 7	18.37 3	49.4 15	55.88 3	14.2 13	35.92 4	38.1 0
20.4	11.13 1	64.2 6	18.35 2	50.8 14	55.86 2	15.4 12	35.92 0	38.1 0
30.4	11.07 6	63.6 6	18.28 7	52.0 12	55.80 6	16.4 10	35.87 5	38.1 0
Feb. 9.3	10.98 9	63.2 4	18.18 10	53.0 10	55.71 9	17.2 8	35.77 10	38.1 0
	12 4		13 8		13 6		13 1	
19.3	10.86	62.8	18.05	53.8	55.58	17.8	35.64	38.0
Mar. 1.3	10.71 15	62.5 3	17.89 16	54.3 5	55.43 15	18.3 5	35.49 15	38.0 0
11.3	10.55 16	62.4 1	17.72 17	54.6 3	55.26 17	18.6 3	35.32 17	37.9 1
21.2	10.38 17	62.3 1	17.55 17	54.7 1	55.09 17	18.6 0	35.14 18	37.8 1
31.2	10.21 17	62.2 1	17.38 17	54.5 2	54.93 16	18.5 1	34.97 17	37.6 2
	14 1		15 4		15 3		15 2	
Apr. 10.2	10.07	62.3	17.23	54.1	54.78	18.2	34.82	37.4
20.2	9.95 12	62.5 2	17.10 13	53.5 6	54.65 13	17.7 5	34.70 12	37.2 2
30.1	9.86 9	62.7 2	17.01 9	52.6 9	54.56 9	17.0 7	34.61 9	37.0 2
May 10.1	9.81 5	63.1 4	16.95 6	51.5 11	54.50 6	16.2 8	34.55 6	36.9 1
20.1	9.80 1	63.6 5	16.93 2	50.3 12	54.49 1	15.2 10	34.55 0	36.8 1
	4 6		2 14		2 12		4 1	
30.0	9.84	64.2	16.95	48.9	54.51	14.0	34.59	36.7
June 9.0	9.92 8	64.9 7	17.01 6	47.3 16	54.58 7	12.7 13	34.67 8	36.7 0
19.0	10.04 12	65.7 8	17.12 11	45.7 16	54.69 11	11.3 14	34.80 13	36.9 2
29.0	10.20 16	66.6 9	17.26 14	44.0 17	54.84 15	9.8 15	34.97 17	37.1 2
July 8.9	10.39 19	67.5 9	17.44 18	42.3 17	55.02 18	8.4 14	35.18 21	37.3 2
	22 10		21 17		21 15		24 3	
18.9	10.61	68.5	17.65	40.6	55.23	6.9	35.42	37.6
28.9	10.86 25	69.4 9	17.89 24	39.0 16	55.47 24	5.5 14	35.68 26	38.0 4
Aug. 7.9	11.13 27	70.3 9	18.14 25	37.5 15	55.73 26	4.2 13	35.97 29	38.4 4
17.8	11.42 29	71.1 8	18.42 28	36.3 12	56.00 27	3.1 11	36.27 30	38.8 4
27.8	11.71 29	71.8 7	18.70 28	35.3 10	56.29 29	2.2 9	36.58 31	39.2 4
	30 5		29 7		29 6		32 3	
Sept. 6.8	12.01	72.3	18.99	34.6	56.58	1.6	36.90	39.5
16.7	12.32 31	72.6 3	19.29 30	34.3 3	56.88 30	1.2 4	37.22 32	39.8 3
26.7	12.62 30	72.7 1	19.58 29	34.3 0	57.17 29	1.2 0	37.55 33	39.9 1
Oct. 6.7	12.92 30	72.6 1	19.87 29	34.6 3	57.46 29	1.5 3	37.87 32	40.0 1
16.7	13.21 29	72.3 3	20.15 28	35.3 7	57.74 28	2.1 6	38.17 30	40.0 0
	27 5		27 10		27 8		30 1	
26.6	13.48	71.8	20.42	36.3	58.01	2.9	38.47	39.9
Nov. 5.6	13.75 27	71.1 7	20.67 25	37.6 13	58.27 26	4.0 11	38.76 29	39.7 2
15.6	13.99 24	70.4 7	20.89 22	39.1 15	58.50 23	5.3 13	39.02 26	39.5 2
25.6	14.20 21	69.5 9	21.10 21	40.8 17	58.71 21	6.7 14	39.25 23	39.3 2
Dec. 5.5	14.38 18	68.6 9	21.27 17	42.5 17	58.88 17	8.2 15	39.45 20	39.1 2
	15 9		13 18		14 16		16 2	
15.5	14.53	67.7	21.40	44.3	59.02	9.8	39.61	38.9
25.5	14.64 11	66.9 8	21.49 9	46.1 18	59.12 10	11.3 15	39.73 12	38.8 1
35.4	14.70 6	66.1 8	21.54 5	47.7 16	59.17 5	12.7 14	39.80 7	38.7 1
Sec δ, Tan δ	1.014	+0.166	1.005	-0.104	1.000	-0.022	1.072	+0.386
Mean Place	9 <sup>h</sup> .193	58 <sup>''</sup> .17	16 <sup>h</sup> .491	53 <sup>''</sup> .66	53 <sup>h</sup> .988	19 <sup>''</sup> .10	33 <sup>h</sup> .850	29 <sup>''</sup> .69
D <sup>∘</sup> α, D <sub>∞</sub> α	0.00	0.00	0.00	0.00	0.00	0.00	+0.01	0.00
D <sup>∘</sup> δ, D <sub>∞</sub> δ	0.0	+1.0	0.0	+1.0	0.0	+1.0	0.0	+1.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ζ Orionis. Mag. 2.0		α Columbae. Mag. 2.8		ο Aurigae. Mag. 5.5		ζ Leporis. Mag. 3.7	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 5 36 s	° ' " — 1 58 "	h m 5 36 s	° ' " — 34 6 "	h m 5 39 s	° ' " + 49 47 "	h m 5 43 s	° ' " — 14 50 "
Jan. 0.5	30.04	66.4	36.28	64.4	21.65	35.4	8.08	65.2
10.4	30.07 3	67.8 14	36.26 2	67.2 28	21.70 5	37.0 16	8.10 2	67.3 21
20.4	30.06 1	69.0 12	36.19 7	69.7 25	21.68 2	38.5 15	8.08 2	69.1 18
30.4	30.00 6	70.1 11	36.08 11	71.8 21	21.60 8	39.9 14	8.02 6	70.7 16
Feb. 9.3	29.91 9	71.0 9	35.92 16	73.6 18	21.46 14	41.0 11	7.91 11	72.0 13
	13	6	19	14	20	9	14	11
19.3	29.78	71.6	35.73	75.0	21.26	41.9	7.77	73.1
Mar. 1.3	29.63 15	72.1 5	35.51 22	75.9 9	21.02 24	42.5 6	7.61 16	73.8 7
11.3	29.46 17	72.4 3	35.28 23	76.4 5	20.76 26	42.7 2	7.43 18	74.2 4
21.2	29.29 17	72.5 1	35.04 24	76.4 0	20.50 26	42.6 1	7.24 19	74.3 1
31.2	29.13 16	72.4 1	34.81 23	75.9 5	20.24 26	42.2 4	7.06 18	74.1 2
	15	4	22	8	23	8	17	5
Apr. 10.2	28.98	72.0	34.59	75.1	20.01	41.4	6.89	73.6
20.2	28.85 13	71.5 5	34.40 19	73.8 13	19.81 20	40.4 10	6.75 14	72.8 8
30.1	28.75 10	70.9 6	34.24 16	72.1 17	19.66 15	39.2 12	6.63 12	71.7 11
May 10.1	28.69 6	70.0 9	34.13 11	70.2 19	19.56 10	37.8 14	6.55 8	70.3 14
20.1	28.67 2	68.9 11	34.06 7	67.9 23	19.53 3	36.3 15	6.51 4	68.7 16
	3	12	3	26	3	16	1	17
30.0	28.70	67.7	34.03	65.3	19.56	34.7	6.52	67.0
June 9.0	28.76 6	66.4 13	34.05 2	62.6 27	19.65 9	33.1 16	6.56 4	65.0 20
19.0	28.86 10	65.0 14	34.12 7	59.8 28	19.81 16	31.6 15	6.65 9	63.0 20
29.0	29.01 15	63.5 15	34.24 12	56.9 29	20.02 21	30.1 15	6.77 12	60.9 21
July 8.9	29.18 17	62.0 15	34.40 16	54.1 28	20.29 27	28.8 13	6.94 17	58.8 21
	21	15	20	28	32	12	19	21
18.9	29.39	60.5	34.60	51.3	20.61	27.6	7.13	56.7
28.9	29.63 24	59.1 14	34.83 23	48.8 25	20.97 36	26.6 10	7.35 22	54.8 19
Aug. 7.9	29.88 25	57.8 13	35.09 26	46.6 22	21.35 38	25.8 8	7.60 25	53.0 18
17.8	30.15 27	56.7 11	35.38 29	44.7 19	21.77 42	25.1 7	7.87 27	51.5 15
27.8	30.43 28	55.8 9	35.68 30	43.2 15	22.20 43	24.7 4	8.15 28	50.4 11
	29	6	32	9	45	2	29	8
Sept. 6.8	30.72	55.2	36.00	42.3	22.65	24.5	8.44	49.6
16.7	31.02 30	54.8 4	36.33 33	41.8 5	23.11 46	24.5 0	8.73 29	49.2 4
26.7	31.32 30	54.8 0	36.65 32	41.9 1	23.57 46	24.7 2	9.03 30	49.2 0
Oct. 6.7	31.61 29	55.1 3	36.97 32	42.6 7	24.02 45	25.0 3	9.32 29	49.6 4
16.7	31.89 28	55.7 6	37.28 31	43.8 12	24.46 44	25.6 6	9.61 29	50.5 9
	27	9	29	18	42	8	27	13
26.6	32.16	56.6	37.57	45.6	24.88	26.4	9.88	51.8
Nov. 5.6	32.42 26	57.7 11	37.84 27	47.8 22	25.28 40	27.4 10	10.14 26	53.4 16
15.6	32.65 23	59.0 13	38.08 24	50.3 25	25.65 37	28.5 11	10.38 24	55.3 19
25.6	32.86 21	60.5 15	38.28 20	53.2 29	25.98 33	29.8 13	10.59 21	57.4 21
Dec. 5.5	33.04 18	62.1 16	38.44 16	56.2 30	26.26 28	31.2 14	10.76 17	59.6 22
	14	16	11	31	22	16	14	23
15.5	33.18	63.7	38.55	59.3	26.48	32.8	10.90	61.9
25.5	33.29 11	65.2 15	38.62 7	62.3 30	26.64 16	34.4 16	11.00 10	64.2 23
35.4	33.34 5	66.7 15	38.63 1	65.2 29	26.74 10	36.0 16	11.05 5	66.4 22
Sec δ, Tan δ	1.001	−0.035	1.208	−0.677	1.549	+1.183	1.035	−0.265
Mean Place	28 <sup>s</sup> .173	72 <sup>''</sup> .54	34 <sup>s</sup> .264	68 <sup>''</sup> .00	18 <sup>s</sup> .817	24 <sup>''</sup> .84	6 <sup>s</sup> .208	70 <sup>''</sup> .26
D'ψ α, Dω α	0.00	0.00	−0.02	0.00	+0.03	−0.01	−0.01	0.00
Dψ δ, Dω δ	0.0	+1.0	0.0	+1.0	0.0	+1.0	0.0	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	κ Orionis. Mag. 2.2		δ Doradus. Mag. 4.5		ν Aurigæ. Mag. 4.2		δ Leporis. Mag. 3.9	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 5 43 s	° ' " — 9 41 "	h m 5 44 s	° ' " — 65 45 "	h m 5 45 s	° ' " + 39 7 "	h m 5 47 s	° ' " — 20 52 "
Jan. 0.5	45.36	51.0	40.44	59.8	38.32	38.4	41.82	63.2
10.4	45.39 3	52.9 19	40.26 18	63.2 34	38.38 6	39.4 10	41.84 2	65.6 24
20.4	45.38 1	54.5 16	39.98 28	66.2 30	38.39 1	40.4 10	41.82 2	67.7 21
30.4	45.32 6	55.9 14	39.62 36	68.8 26	38.33 6	41.3 9	41.74 8	69.6 19
Feb. 9.4	45.22 10	57.0 11	39.19 43	71.0 22	38.23 10	42.1 8	41.63 11	71.2 16
	13	10	50	17	15	6	15	12
19.3	45.09	58.0	38.69	72.7	38.08	42.7	41.48	72.4
Mar. 1.3	44.93 16	58.6 6	38.15 54	73.9 12	37.89 19	43.1 4	41.31 17	73.3 9
11.3	44.76 17	59.0 4	37.59 56	74.5 6	37.68 21	43.3 2	41.12 19	73.8 5
21.2	44.58 18	59.1 1	37.01 58	74.5 0	37.47 21	43.2 1	40.92 20	73.9 1
31.2	44.41 17	58.9 2	36.45 56	74.0 5	37.26 21	43.0 2	40.73 19	73.7 2
	16	4	54	10	19	5	18	6
Apr. 10.2	44.25	58.5	35.91	73.0	37.07	42.5	40.55	73.1
20.2	44.11 14	57.8 7	35.42 49	71.5 15	36.91 16	41.8 7	40.39 16	72.2 9
30.1	44.00 11	56.9 9	34.97 45	69.6 19	36.78 13	41.0 8	40.26 13	71.0 12
May 10.1	43.93 7	55.7 12	34.60 37	67.2 24	36.70 8	40.0 10	40.17 9	69.5 15
20.1	43.90 3	54.4 13	34.30 30	64.5 27	36.68 2	39.0 10	40.12 5	67.8 17
	1	16	22	30	3	10	1	20
30.1	43.91	52.8	34.08	61.5	36.71	38.0	40.11	65.8
June 9.0	43.96 5	51.1 17	33.96 12	58.3 32	36.79 8	37.0 10	40.14 3	63.6 22
19.0	44.05 9	49.3 18	33.92 4	55.0 33	36.92 13	36.0 10	40.22 8	61.3 23
29.0	44.18 13	47.5 18	33.98 6	51.6 34	37.10 18	35.1 9	40.34 12	59.0 23
July 8.9	44.34 16	45.6 19	34.13 15	48.3 33	37.33 23	34.3 8	40.49 15	56.6 24
	20	19	23	32	27	7	19	23
18.9	44.54	43.7	34.36	45.1	37.60	33.6	40.68	54.3
28.9	44.76 22	42.0 17	34.67 31	42.1 30	37.90 30	33.0 6	40.90 22	52.2 21
Aug. 7.9	45.01 25	40.4 16	35.06 39	39.5 26	38.23 33	32.6 4	41.14 24	50.3 19
17.8	45.27 26	39.1 13	35.51 45	37.3 22	38.58 35	32.2 4	41.41 27	48.7 16
27.8	45.55 28	38.1 10	36.01 50	35.6 17	38.95 37	32.0 2	41.69 28	47.4 13
	29	8	54	12	37	1	29	9
Sept. 6.8	45.84	37.3	36.55	34.4	39.32	31.9	41.98	46.5
16.8	46.13 29	36.9 4	37.11 56	33.9 5	39.71 39	31.9 0	42.28 30	46.1 4
26.7	46.43 30	36.9 0	37.67 56	34.0 1	40.09 38	32.0 1	42.59 31	46.1 0
Oct. 6.7	46.72 29	37.3 4	38.23 56	34.8 8	40.48 39	32.1 1	42.89 30	46.6 5
16.7	47.01 29	38.1 8	38.76 53	36.3 15	40.86 38	32.4 3	43.18 29	47.6 10
	27	11	49	20	36	4	28	15
26.6	47.28	39.2	39.25	38.3	41.22	32.8	43.46	49.1
Nov. 5.6	47.54 26	40.7 15	39.69 44	40.9 26	41.56 34	33.3 5	43.72 26	50.9 18
15.6	47.78 24	42.3 16	40.05 36	43.9 30	41.88 32	33.9 6	43.96 24	53.0 21
25.6	47.99 21	44.2 19	40.33 28	47.2 33	42.17 29	34.6 7	44.17 21	55.4 24
Dec. 5.5	48.17 18	46.2 20	40.52 19	50.8 36	42.42 25	35.4 8	44.35 18	57.9 25
	14	20	9	37	21	9	14	26
15.5	48.31	48.2	40.61	54.5	42.63	36.3	44.49	60.5
25.5	48.41 10	50.2 20	40.59 2	58.1 36	42.78 15	37.2 9	44.59 10	63.1 26
35.5	48.47 6	52.1 19	40.48 11	61.6 35	42.88 10	38.2 10	44.64 5	65.6 25
Sec δ, Tan δ	1.015	—0.171	2.436	—2.221	1.289	+0.813	1.070	—0.382
Mean Place	43°.496	56''.49	37°.108	62''.69	35°.884	29''.15	39°.924	67''.97
D <sub>α</sub> α, D <sub>α</sub> α	0.00	0.00	—0.06	+0.01	+0.02	0.00	—0.01	0.00
D <sub>β</sub> δ, D <sub>α</sub> δ	0.0	+1.0	0.0	+1.0	0.0	+1.0	0.0	+1.0





FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	θ Aurigæ. Mag. 2.7		1 Geminorum. Mag. 4.3		1 Puppis (G.). Mag. 6.2		ν Orionis. Mag. 4.4	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 5 53 s	° ' " + 37 12 "	h m 5 58 s	° ' " + 23 16 "	h m 6 2 s	° ' " - 45 1 "	h m 6 2 s	° ' " + 14 46 "
Jan. 0.5	57.91	36.3	59.33	15.2	3.85	65.7	45.18	53.0
10.4	57.98 7	37.2 9	59.40 7	15.3 1	3.83 2	68.9 32	45.24 6	52.6 4
20.4	57.99 1	38.0 8	59.42 2	15.4 1	3.75 8	71.9 30	45.26 2	52.2 4
30.4	57.95 4	38.9 9	59.39 3	15.5 1	3.61 14	74.5 26	45.24 2	51.9 3
Feb. 9.4	57.86 9 14	39.6 7 6	59.32 7 12	15.7 2 1	3.43 18 23	76.7 22 18	45.17 7 11	51.6 3 1
19.3	57.72 18	40.2 4	59.20 15	15.8 1	3.20 27	78.5 13	45.06 14	51.5 2
Mar. 1.3	57.54 20	40.6 2	59.05 17	15.9 0	2.93 28	79.8 8	44.92 16	51.3 0
11.3	57.34 21	40.8 0	58.88 17	15.9 0	2.65 30	80.6 3	44.76 17	51.3 1
21.3	57.13 20	40.8 2	58.71 18	15.9 1	2.35 29	80.9 2	44.59 17	51.2 0
31.2	56.93 19	40.6 4	58.53 16	15.8 1	2.06 28	80.7 7	44.42 16	51.2 0
Apr. 10.2	56.74 16	40.2 6	58.37 14	15.7 2	1.78 26	80.0 11	44.26 13	51.2 0
20.2	56.58 13	39.6 7	58.23 11	15.5 3	1.52 23	78.9 16	44.13 11	51.2 1
30.1	56.45 8	38.9 8	58.12 8	15.2 2	1.29 19	77.3 20	44.02 7	51.3 1
May 10.1	56.37 3	38.1 9	58.04 3	15.0 2	1.10 13	75.3 23	43.95 3	51.4 2
20.1	56.34 2	37.2 10	58.01 2	14.8 2	0.97 8	73.0 27	43.92 1	51.6 3
30.1	56.36 7	36.2 9	58.03 6	14.6 1	0.89 4	70.3 28	43.93 5	51.9 3
June 9.0	56.43 12	35.3 9	58.09 11	14.5 1	0.85 2	67.5 31	43.98 9	52.2 4
19.0	56.55 17	34.4 8	58.20 14	14.4 1	0.87 8	64.4 31	44.07 14	52.6 5
29.0	56.72 22	33.6 7	58.34 19	14.3 1	0.95 12	61.3 31	44.21 17	53.1 5
July 9.0	56.94 25	32.9 7	58.53 22	14.4 0	1.07 18	58.2 30	44.38 20	53.6 5
18.9	57.19 28	32.2 5	58.75 25	14.4 2	1.25 21	55.2 29	44.58 23	54.1 5
28.9	57.47 32	31.7 5	59.00 27	14.6 1	1.46 26	52.3 25	44.81 26	54.6 5
Aug. 7.9	57.79 34	31.2 3	59.27 29	14.7 1	1.72 30	49.8 22	45.07 27	55.1 4
17.8	58.13 35	30.9 3	59.56 31	14.8 1	2.02 32	47.6 18	45.34 29	55.5 4
27.8	58.48 37	30.6 2	59.87 31	14.9 1	2.34 34	45.8 12	45.63 30	55.9 2
Sept. 6.8	58.85 37	30.4 0	60.18 33	15.0 0	2.68 35	44.6 7	45.93 31	56.1 1
16.8	59.22 38	30.4 1	60.51 33	15.0 0	3.03 37	43.9 0	46.24 31	56.2 0
26.7	59.60 38	30.3 1	60.84 33	15.0 1	3.40 36	43.9 5	46.55 31	56.2 2
Oct. 6.7	59.98 37	30.4 2	61.17 32	14.9 2	3.76 36	44.4 12	46.86 31	56.0 4
16.7	60.35 36	30.6 2	61.49 32	14.7 2	4.12 34	45.6 17	47.17 30	55.6 5
26.7	60.71 34	30.8 3	61.81 30	14.5 3	4.46 31	47.3 23	47.47 29	55.1 6
Nov. 5.6	61.05 32	31.1 5	62.11 29	14.2 2	4.77 28	49.6 27	47.76 27	54.5 6
15.6	61.37 29	31.6 5	62.40 26	14.0 3	5.05 24	52.3 30	48.03 25	53.9 7
25.6	61.66 26	32.1 6	62.66 23	13.7 2	5.29 20	55.3 33	48.28 22	53.2 7
Dec. 5.5	61.92 21	32.7 8	62.89 19	13.5 1	5.49 14	58.6 35	48.50 19	52.5 7
15.5	62.13 16	33.5 8	63.08 15	13.4 1	5.63 8	62.1 34	48.69 14	51.8 6
25.5	62.29 10	34.3 8	63.23 10	13.3 0	5.71 2	65.5 34	48.83 10	51.2 6
35.5	62.39	35.1	63.33	13.3	5.73	68.9 34	48.93	50.6 6
Sec δ, Tan δ	1.256	+0.759	1.089	+0.430	1.415	-1.001	1.034	+0.264
Mean Place	55°.502	27''.69	57°.210	7''.88	1°.631	69''.90	43°.158	46''.33
D <sub>α</sub> , D <sub>α</sub> α	+0.02	0.00	+0.01	0.00	-0.03	0.00	+0.01	0.00
D <sub>δ</sub> , D <sub>δ</sub> δ	0.0	+1.0	0.0	+1.0	0.0	+1.0	0.0	+1.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Geminorum. Mag. 3.2		$\psi^1$ Aurigæ. Mag. 5.1		$\beta$ Canis Majoris. Mag. 2.0		$\delta$ Monocerotis. Mag. 4.5	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 6 17 s ° ' "	° ' "	h m 6 18 s ° ' "	° ' "	h m 6 18 s ° ' "	° ' "	h m 6 19 s ° ' "	° ' "
Jan. 0.5	51.26	36.0	24.25	64.6	59.26	41.1	17.81	18.7
10.5	51.35 9	36.0 °	24.36 11	66.1 15	59.32 6	43.5 24	17.88 7	17.5 12
20.4	51.39 4	36.0 °	24.39 3	67.7 16	59.33 1	45.6 21	17.91 3	16.5 10
30.4	51.38 1	36.1 1	24.36 3	69.2 15	59.28 5	47.6 20	17.90 1	15.6 9
Feb. 9.4	51.32 6	36.3 2	24.26 10	70.6 14	59.20 8	49.2 16	17.84 6	14.9 7
	10	1	16	11	13	13	10	5
Mar. 19.3	51.22	36.4	24.10	71.7	59.07	50.5	17.74	14.4
1.3	51.08 14	36.5 1	23.89 21	72.6 9	58.92 15	51.5 10	17.60 14	14.0 4
11.3	50.92 16	36.6 1	23.65 24	73.2 6	58.74 18	52.2 7	17.45 15	13.7 3
21.3	50.74 18	36.7 1	23.39 26	73.5 3	58.55 19	52.5 3	17.29 16	13.6 1
31.2	50.57 17	36.7 °	23.13 26	73.5 °	58.36 19	52.5 °	17.12 17	13.6 °
	17	1	25	4	18	3	16	2
Apr. 10.2	50.40	36.6	22.88	73.1	58.18	52.2	16.96	13.8
20.2	50.25 15	36.5 1	22.66 22	72.4 7	58.02 16	51.6 6	16.82 14	14.0 2
30.2	50.13 12	36.4 1	22.48 18	71.5 9	57.88 14	50.6 10	16.70 12	14.4 4
May 10.1	50.05 8	36.2 2	22.34 14	70.3 12	57.77 11	49.3 13	16.62 8	14.9 5
20.1	50.01 4	36.0 2	22.26 8	69.0 13	57.70 7	47.8 15	16.57 5	15.6 7
	1	2	2	15	3	17	1	7
June 30.1	50.00	35.8	22.24	67.5	57.67	46.1	16.56	16.3
9.0	50.05 5	35.7 1	22.28 4	65.9 16	57.68 1	44.2 19	16.59 3	17.2 9
19.0	50.13 8	35.6 1	22.38 10	64.3 16	57.73 5	42.2 20	16.67 8	18.1 9
29.0	50.26 13	35.6 °	22.54 16	62.7 16	57.82 9	40.0 22	16.78 11	19.1 10
July 9.0	50.42 16	35.6 °	22.76 22	61.2 15	57.95 13	37.8 22	16.92 14	20.1 10
	20	°	26	14	16	21	18	10
18.9	50.62	35.6	23.02	59.8	58.11	35.7	17.10	21.1
28.9	50.85 23	35.6 °	23.33 31	58.4 14	58.30 19	33.7 20	17.31 21	22.1 10
Aug. 7.9	51.11 26	35.7 1	23.68 35	57.2 12	58.52 22	31.9 18	17.54 23	23.0 9
17.9	51.39 28	35.7 °	24.06 38	56.2 10	58.77 25	30.3 16	17.79 25	23.8 8
27.8	51.68 29	35.7 °	24.46 40	55.3 9	59.03 26	29.0 13	18.06 27	24.4 6
	31	°	43	7	28	10	28	4
Sep. 6.8	51.99	35.7	24.89	54.6	59.31	28.0	18.34	24.8
16.8	52.31 32	35.6 1	25.33 44	54.1 5	59.60 29	27.5 5	18.63 29	24.9 1
26.7	52.64 33	35.4 2	25.78 45	53.8 3	59.90 30	27.4 1	18.93 30	24.9 °
Oct. 6.7	52.97 33	35.1 3	26.24 46	53.6 2	60.20 30	27.8 4	19.23 30	24.6 3
16.7	53.30 33	34.8 3	26.69 45	53.7 1	60.50 30	28.7 9	19.53 30	24.0 6
	32	4	44	3	29	13	29	8
Nov. 26.7	53.62	34.4	27.13	54.0	60.79	30.0	19.82	23.2
5.6	53.93 31	34.0 4	27.56 43	54.4 4	61.07 28	31.6 16	20.11 29	22.1 11
15.6	54.23 30	33.6 4	27.97 41	55.1 7	61.33 26	33.6 20	20.38 27	21.0 11
25.6	54.50 27	33.2 4	28.34 37	56.1 10	61.57 24	35.9 23	20.63 25	19.7 13
Dec. 5.6	54.75 25	32.8 4	28.67 33	57.2 11	61.78 21	38.3 24	20.85 22	18.3 14
	21	3	28	13	17	25	19	13
15.5	54.96	32.5	28.95	58.5	61.95	40.8	21.04	17.0
25.5	55.13 17	32.3 2	29.16 21	59.9 14	62.08 13	43.3 25	21.19 15	15.7 13
35.5	55.24 11	32.2 1	29.31 15	61.4 15	62.17 9	45.8 25	21.30 11	14.4 13
Mean $\delta$ , Tan $\delta$	1.083	+0.415	1.534	+1.164	1.051	-0.323	1.003	+0.081
Mean Place	49°.125	29''.65	21°.286	57''.25	57°.372	46''.37	15°.865	12''.90
$\phi a$ , $D_{\phi a}$	+0.01	0.00	+0.03	+0.01	-0.01	0.00	0.00	0.00
$\phi \delta$ , $D_{\phi \delta}$	0.0	+1.0	0.0	+1.0	0.0	+1.0	0.0	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\alpha$ Argus. (Canopus.) Mag. -0.9		10 Monocerotis. Mag. 5.0		$\gamma$ Geminorum. Mag. 4.1		$\delta$ Lynceis. Mag. 6.0	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 6 22	° ' - 52 38	h m 6 23	° ' - 4 42	h m 6 23	° ' + 20 16	h m 6 29	° ' + 61 33
	s	"	s	"	s	"	s	"
Jan. 0.5	6.32	51.1	47.69	25.9	57.09	7.0	59.59	33.2
10.5	6.30 2	54.6 35	47.76 7	27.6 17	57.19 10	6.8 2	59.73 14	35.4 22
20.4	6.21 9	57.8 32	47.79 3	29.1 15	57.23 4	6.7 1	59.78 5	37.6 22
30.4	6.06 15	60.7 29	47.77 2	30.5 14	57.22 1	6.6 1	59.72 6	39.7 21
Feb. 9.4	5.85 21	63.3 26	47.70 7	31.6 11	57.17 5	6.7 1	59.58 14	41.6 19
	27	21	10	9	10	0	23	16
19.4	5.58	65.4	47.60	32.5	57.07	6.7	59.35	43.2
Mar. 1.3	5.27 31	67.1 17	47.46 14	33.2 7	56.94 13	6.8 1	59.06 29	44.5 13
11.3	4.93 34	68.2 11	47.31 15	33.7 5	56.78 16	6.9 1	58.73 33	45.5 10
21.3	4.57 36	68.8 6	47.14 17	33.9 2	56.61 17	6.9 0	58.36 37	46.0 5
31.2	4.22 35	68.9 1	46.97 17	33.9 0	56.43 18	7.0 1	57.98 38	46.0 0
	35	5	17	2	16	0	36	3
Apr. 10.2	3.87	68.4	46.80	33.7	56.27	7.0	57.62	45.7
20.2	3.54 33	67.5 9	46.65 15	33.3 4	56.12 15	6.9 1	57.28 34	44.9 8
30.2	3.25 29	66.1 14	46.53 12	32.6 7	56.00 12	6.9 0	57.00 28	43.7 12
May 10.1	3.00 25	64.3 18	46.44 9	31.8 8	55.91 9	6.8 1	56.77 23	42.2 15
20.1	2.79 21	62.0 23	46.38 6	30.8 10	55.87 4	6.7 1	56.62 15	40.4 18
	15	26	2	12	1	0	8	20
30.1	2.64	59.4	46.36	29.6	55.86	6.7	56.54	38.4
June 9.1	2.55 9	56.6 28	46.38 2	28.3 13	55.89 3	6.7 0	56.54 0	36.3 21
			6		8		9	22
19.0	2.52 3	53.5 31	46.44 10	26.9 14	55.97 12	6.7 0	56.63 9	34.1 22
29.0	2.56 4	50.3 32	46.54 13	25.5 14	56.09 16	6.8 1	56.80 17	31.9 22
July 9.0	2.65 9	47.1 32	46.67 17	24.0 15	56.25 19	6.9 1	57.04 24	29.7 22
	14	31	17	16			31	21
18.9	2.79	44.0	46.84	22.4	56.44	7.0	57.35	27.6
28.9	3.00 21	41.0 30	47.03 19	21.0 14	56.66 22	7.2 2	57.73 38	25.6 20
Aug. 7.9	3.25 25	38.2 28	47.25 22	19.7 13	56.91 25	7.3 1	58.16 43	23.8 18
					27		48	16
17.9	3.55 30	35.8 24	47.50 25	18.6 11	57.18 28	7.4 1	58.64 52	22.2 14
27.8	3.89 34	33.8 20	47.76 26	17.7 9	57.46 30	7.4 0	59.16 55	20.8 11
	37	14	27	6				
Sept. 6.8	4.26	32.4	48.03	17.1	57.76	7.4	59.71	19.7
16.8	4.66 40	31.5 9	48.32 29	16.7 4	58.08 32	7.3 1	60.29 58	18.8 9
26.8	5.07 41	31.2 3	48.61 29	16.8 1	58.40 32	7.1 2	60.89 60	18.3 5
Oct. 6.7	5.48 41	31.6 4	48.91 30	17.1 3	58.72 32	6.8 3	61.49 60	18.0 3
16.7	5.89 41	32.6 10	49.20 29	17.8 7	59.05 33	6.4 4	62.10 61	18.0 6
	39	16	30	10	32	5	59	4
26.7	6.28	34.2	49.50	18.8	59.37	5.9	62.69	18.4
Nov. 5.6	6.65 37	36.4 22	49.78 28	20.1 13	59.68 31	5.3 6	63.26 57	19.1 7
15.6	6.98 33	39.1 27	50.05 27	21.7 16	59.97 29	4.8 5	63.80 54	20.1 10
25.6	7.26 28	42.2 31	50.29 24	23.4 17	60.25 28	4.2 6	64.30 50	21.4 13
Dec. 5.6	7.49 23	45.6 34	50.51 22	25.2 18	60.49 24	3.7 5	64.74 44	23.0 16
	17	36	18	19	21	4	37	18
15.5	7.66	49.2	50.69	27.1	60.70	3.3	65.11	24.8
25.5	7.76 10	52.8 36	50.84 15	29.0 19	60.88 18	2.9 4	65.40 29	26.8 20
35.5	7.79 3	56.4 36	50.94 10	30.8 18	61.00 12	2.6 3	65.60 20	29.0 22
Sec $\delta$ , Tan $\delta$	1.648	-1.310	1.003	-0.082	1.066	+0.369	2.100	+1.846
Mean Place	3 <sup>h</sup> .901	56 <sup>m</sup> .20	45 <sup>h</sup> .790	31 <sup>m</sup> .38	54 <sup>h</sup> .979	0 <sup>m</sup> .97	55 <sup>h</sup> .621	26 <sup>m</sup> .63
D $\downarrow$ $\alpha$ , D $\infty$ $\alpha$	-0.03	-0.01	0.00	0.00	+0.01	0.00	+0.05	+0.02
D $\downarrow$ $\delta$ , D $\infty$ $\delta$	0.0	+1.0	0.0	+1.0	0.0	+1.0	-0.1	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ξ <sup>2</sup> Canis Majoris. Mag. 4.5		23 H. Camelop. Mag. 5.6		51 Aurigæ. Mag. 5.7		γ Geminorum. Mag. 1.9	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 6 31 s	° ' -22 53 "	h m 6 31 s	° ' +79 39 "	h m 6 32 s	° ' +39 27 "	h m 6 32 s	° ' +16 28 "
an. 0.5	31.56 6	41.1 26	54.79 22	39.6 30	48.79 12	66.6 10	50.19 10	27.4 5
10.5	31.62 1	43.7 25	55.01 3	42.6 29	48.91 6	67.6 10	50.29 5	26.9 3
20.4	31.63 4	46.2 22	54.98 27	45.5 27	48.97 1	68.6 10	50.34 0	26.6 2
30.4	31.59 8	48.4 19	54.71 50	48.2 25	48.96 6	69.6 10	50.34 4	26.4 2
eb. 9.4	31.51 13	50.3 15	54.21 71	50.7 21	48.90 12	70.6 9	50.30 9	26.2 1
19.4	31.38 16	51.8 12	53.50 87	52.8 17	48.78 16	71.5 7	50.21 13	26.1 0
ar. 1.3	31.22 18	53.0 9	52.63 99	54.5 12	48.62 19	72.2 5	50.08 15	26.1 0
11.3	31.04 20	53.9 4	51.64 107	55.7 6	48.43 21	72.7 3	49.93 17	26.1 0
21.3	30.84 20	54.3 1	50.57 109	56.3 1	48.22 21	73.0 1	49.76 17	26.1 1
31.2	30.64 19	54.4 3	49.48 106	56.4 5	48.01 21	73.1 1	49.59 16	26.2 0
or. 10.2	30.45 18	54.1 6	48.42 99	55.9 11	47.80 19	73.0 4	49.43 15	26.2 1
20.2	30.27 15	53.5 9	47.43 88	54.8 16	47.61 15	72.6 6	49.28 12	26.3 0
30.2	30.12 13	52.6 13	46.55 73	53.2 19	47.46 12	72.0 7	49.16 9	26.3 1
ly 10.1	29.99 9	51.3 16	45.82 56	51.3 23	47.34 7	71.3 9	49.07 5	26.4 1
20.1	29.90 5	49.7 18	45.26 36	49.0 26	47.27 3	70.4 10	49.02 2	26.5 2
30.1	29.85 0	47.9 21	44.90 15	46.4 29	47.24 3	69.4 10	49.00 3	26.7 2
ne 9.1	29.85 3	45.8 22	44.75 6	43.5 29	47.27 8	68.4 11	49.03 7	26.9 2
19.0	29.88 7	43.6 23	44.81 27	40.6 30	47.35 13	67.3 11	49.10 10	27.1 3
29.0	29.95 11	41.3 24	45.08 48	37.6 29	47.48 17	66.2 10	49.20 15	27.4 3
ly 9.0	30.06 15	38.9 23	45.56 67	34.7 28	47.65 22	65.2 10	49.35 18	27.7 3
18.9	30.21 18	36.6 22	46.23 84	31.9 27	47.87 25	64.2 10	49.53 20	28.0 3
28.9	30.39 21	34.4 20	47.07 101	29.2 24	48.12 29	63.2 8	49.73 24	28.3 2
ig. 7.9	30.60 24	32.4 18	48.08 115	26.8 21	48.41 31	62.4 8	49.97 26	28.5 2
17.9	30.84 26	30.6 14	49.23 127	24.7 18	48.72 34	61.6 7	50.23 27	28.7 2
27.8	31.10 27	29.2 11	50.50 136	22.9 15	49.06 36	60.9 7	50.50 29	28.9 0
pt. 6.8	31.37 29	28.1 6	51.86 144	21.4 11	49.42 37	60.2 5	50.79 30	28.9 1
16.8	31.66 30	27.5 2	53.30 149	20.3 7	49.79 38	59.7 5	51.09 31	28.8 2
26.8	31.96 31	27.3 4	54.79 151	19.6 2	50.17 39	59.2 3	51.40 32	28.6 4
t. 6.7	32.27 31	27.7 8	56.30 151	19.4 2	50.56 39	58.9 3	51.72 32	28.2 5
16.7	32.58 30	28.5 13	57.81 147	19.6 6	50.95 39	58.6 1	52.04 32	27.7 6
26.7	32.88 29	29.8 18	59.28 141	20.2 11	51.34 38	58.5 0	52.36 30	27.1 8
ov. 5.6	33.17 28	31.6 21	60.69 131	21.3 15	51.72 36	58.5 2	52.66 30	26.3 7
15.6	33.45 25	33.7 24	62.00 117	22.8 19	52.08 34	58.7 3	52.96 27	25.6 8
25.6	33.70 22	36.1 26	63.17 83	24.7 22	52.42 26	59.0 5	53.23 22	24.8 7
ec. 5.6	33.92 18	38.7 28	64.19 83	26.9 25	52.72 26	59.5 6	53.48 22	24.0 7
15.5	34.10 14	41.5 28	65.02 61	29.4 28	52.98 21	60.1 8	53.70 17	23.3 7
25.5	34.24 9	44.3 27	65.63 37	32.2 29	53.19 15	60.9 9	53.87 13	22.6 5
35.5	34.33	47.0	66.00	35.1	53.34	61.8	54.00	22.1
c δ, Tan δ	1.086	-0.422	5.572	+5.481	1.295	+0.823	1.043	+0.296
ean Place	29°.654	46''.43	44°.976	32''.76	46°.215	60''.74	48°.129	21''.89
φa, D <sub>a</sub> a	-0.01	0.00	+0.14	+0.05	+0.02	+0.01	+0.01	0.00
φδ, D <sub>a</sub> δ	-0.1	+1.0	-0.1	+1.0	-0.1	+1.0	-0.1	+1.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\psi^6$ Aurigæ. Mag. 5.3		$\alpha$ Canis Majoris. (Sirius.) Mag. -1.6		18 Monocerotis. Mag. 4.7		43 Camelop. Mag. 5.1	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 6 40 s	° ' " +43 39 "	h m 6 41 s	° ' " -16 35 "	h m 6 43 s	° ' " + 2 30 "	h m 6 44 s	° ' " +68 59 "
Jan. 0.5	39.71	52.7	25.88	51.0	27.64	26.9	38.09	25.2
10.5	39.84 <sup>13</sup>	53.9 <sup>12</sup>	25.96 <sup>8</sup>	53.4 <sup>24</sup>	27.74 <sup>10</sup>	25.6 <sup>13</sup>	38.28 <sup>19</sup>	27.7 <sup>25</sup>
20.4	39.91 <sup>7</sup>	55.2 <sup>13</sup>	25.98 <sup>2</sup>	55.6 <sup>22</sup>	27.79 <sup>5</sup>	24.4 <sup>12</sup>	38.35 <sup>7</sup>	30.3 <sup>26</sup>
30.4	39.91 <sup>0</sup>	56.5 <sup>13</sup>	25.96 <sup>2</sup>	57.6 <sup>20</sup>	27.79 <sup>0</sup>	23.4 <sup>10</sup>	38.29 <sup>6</sup>	32.7 <sup>24</sup>
Feb. 9.4	39.85 <sup>6</sup>	57.7 <sup>12</sup>	25.89 <sup>7</sup>	59.3 <sup>17</sup>	27.75 <sup>4</sup>	22.5 <sup>9</sup>	38.11 <sup>18</sup>	35.0 <sup>23</sup>
19.4	39.73 <sup>12</sup>	58.8 <sup>11</sup>	25.78 <sup>11</sup>	60.7 <sup>14</sup>	27.66 <sup>9</sup>	21.8 <sup>7</sup>	37.82 <sup>29</sup>	37.0 <sup>20</sup>
Mar. 1.3	39.56 <sup>17</sup>	59.7 <sup>9</sup>	25.63 <sup>15</sup>	61.8 <sup>11</sup>	27.54 <sup>12</sup>	21.3 <sup>5</sup>	37.43 <sup>39</sup>	37.0 <sup>16</sup>
11.3	39.36 <sup>20</sup>	60.4 <sup>7</sup>	25.46 <sup>17</sup>	62.6 <sup>8</sup>	27.40 <sup>14</sup>	21.0 <sup>3</sup>	36.98 <sup>45</sup>	38.6 <sup>12</sup>
21.3	39.14 <sup>22</sup>	60.8 <sup>4</sup>	25.28 <sup>18</sup>	63.1 <sup>5</sup>	27.24 <sup>16</sup>	20.8 <sup>2</sup>	36.48 <sup>50</sup>	39.8 <sup>8</sup>
31.3	38.91 <sup>23</sup>	61.0 <sup>2</sup>	25.09 <sup>19</sup>	63.2 <sup>1</sup>	27.07 <sup>17</sup>	20.8 <sup>0</sup>	35.97 <sup>51</sup>	40.6 <sup>2</sup>
Apr. 10.2	38.69 <sup>22</sup>	60.9 <sup>1</sup>	24.91 <sup>18</sup>	63.0 <sup>2</sup>	26.91 <sup>16</sup>	20.8 <sup>1</sup>	35.46 <sup>51</sup>	40.8 <sup>3</sup>
20.2	38.48 <sup>21</sup>	60.5 <sup>4</sup>	24.74 <sup>17</sup>	63.0 <sup>5</sup>	26.91 <sup>15</sup>	20.9 <sup>3</sup>	35.46 <sup>47</sup>	40.5 <sup>7</sup>
30.2	38.30 <sup>18</sup>	59.9 <sup>6</sup>	24.60 <sup>14</sup>	62.5 <sup>8</sup>	26.76 <sup>15</sup>	21.2 <sup>3</sup>	34.99 <sup>47</sup>	39.8 <sup>12</sup>
May 10.1	38.17 <sup>13</sup>	59.9 <sup>8</sup>	24.60 <sup>11</sup>	61.7 <sup>8</sup>	26.63 <sup>13</sup>	21.6 <sup>4</sup>	34.57 <sup>42</sup>	38.6 <sup>15</sup>
20.1	38.08 <sup>9</sup>	59.1 <sup>10</sup>	24.49 <sup>8</sup>	60.6 <sup>11</sup>	26.53 <sup>10</sup>	22.1 <sup>5</sup>	34.22 <sup>35</sup>	37.1 <sup>19</sup>
30.1	38.04 <sup>4</sup>	58.1 <sup>12</sup>	24.41 <sup>5</sup>	59.3 <sup>13</sup>	26.47 <sup>6</sup>	22.8 <sup>7</sup>	33.96 <sup>26</sup>	35.2 <sup>22</sup>
June 9.1	38.06 <sup>2</sup>	57.8 <sup>13</sup>	24.36 <sup>1</sup>	59.3 <sup>15</sup>	26.44 <sup>1</sup>	22.8 <sup>8</sup>	33.80 <sup>16</sup>	35.2 <sup>22</sup>
19.0	38.06 <sup>2</sup>	56.9 <sup>13</sup>	24.35 <sup>1</sup>	57.8 <sup>18</sup>	26.44 <sup>1</sup>	23.6 <sup>9</sup>	33.80 <sup>6</sup>	33.0 <sup>24</sup>
29.0	38.13 <sup>7</sup>	55.6 <sup>13</sup>	24.35 <sup>4</sup>	56.0 <sup>18</sup>	26.45 <sup>1</sup>	24.5 <sup>10</sup>	33.74 <sup>5</sup>	30.6 <sup>25</sup>
July 9.0	38.13 <sup>12</sup>	54.3 <sup>13</sup>	24.39 <sup>7</sup>	54.1 <sup>19</sup>	26.45 <sup>5</sup>	24.5 <sup>10</sup>	33.79 <sup>15</sup>	28.1 <sup>26</sup>
19.0	38.25 <sup>17</sup>	53.0 <sup>13</sup>	24.46 <sup>11</sup>	54.1 <sup>19</sup>	26.50 <sup>9</sup>	25.5 <sup>10</sup>	33.79 <sup>5</sup>	25.5 <sup>26</sup>
28.9	38.42 <sup>22</sup>	51.7 <sup>12</sup>	24.46 <sup>15</sup>	52.2 <sup>20</sup>	26.59 <sup>12</sup>	26.5 <sup>10</sup>	33.94 <sup>26</sup>	22.9 <sup>25</sup>
Aug. 7.9	38.42 <sup>22</sup>	50.5 <sup>12</sup>	24.57 <sup>15</sup>	50.2 <sup>20</sup>	26.71 <sup>16</sup>	27.5 <sup>11</sup>	34.20 <sup>35</sup>	22.9 <sup>25</sup>
17.9	38.64 <sup>26</sup>	49.3 <sup>12</sup>	24.72 <sup>18</sup>	48.2 <sup>19</sup>	26.44 <sup>1</sup>	23.6 <sup>9</sup>	33.80 <sup>6</sup>	33.0 <sup>24</sup>
27.8	38.90 <sup>29</sup>	48.1 <sup>12</sup>	24.90 <sup>20</sup>	46.3 <sup>19</sup>	26.87 <sup>18</sup>	28.6 <sup>10</sup>	34.55 <sup>44</sup>	20.4 <sup>23</sup>
Sept. 6.8	39.19 <sup>33</sup>	47.1 <sup>10</sup>	25.10 <sup>23</sup>	44.6 <sup>17</sup>	27.05 <sup>21</sup>	29.6 <sup>10</sup>	34.99 <sup>52</sup>	18.1 <sup>22</sup>
16.8	39.52 <sup>35</sup>	46.2 <sup>9</sup>	25.33 <sup>25</sup>	44.6 <sup>17</sup>	27.26 <sup>23</sup>	30.5 <sup>9</sup>	35.51 <sup>58</sup>	15.9 <sup>20</sup>
26.8	39.87 <sup>37</sup>	45.3 <sup>7</sup>	25.58 <sup>27</sup>	43.1 <sup>15</sup>	27.49 <sup>25</sup>	31.3 <sup>8</sup>	36.09 <sup>65</sup>	13.9 <sup>18</sup>
Oct. 6.7	40.24 <sup>39</sup>	44.6 <sup>5</sup>	25.85 <sup>28</sup>	41.9 <sup>8</sup>	27.74 <sup>27</sup>	31.9 <sup>6</sup>	36.74 <sup>70</sup>	12.1 <sup>15</sup>
16.7	40.63 <sup>41</sup>	44.1 <sup>5</sup>	26.13 <sup>29</sup>	41.1 <sup>5</sup>	28.01 <sup>28</sup>	32.3 <sup>2</sup>	37.44 <sup>74</sup>	10.6 <sup>11</sup>
26.7	41.04 <sup>42</sup>	43.6 <sup>3</sup>	26.42 <sup>30</sup>	40.6 <sup>5</sup>	28.29 <sup>30</sup>	32.5 <sup>1</sup>	38.18 <sup>76</sup>	9.5 <sup>11</sup>
Nov. 5.7	41.46 <sup>41</sup>	43.2 <sup>1</sup>	26.72 <sup>30</sup>	40.5 <sup>1</sup>	28.59 <sup>30</sup>	32.4 <sup>1</sup>	38.94 <sup>78</sup>	8.6 <sup>9</sup>
15.6	41.87 <sup>41</sup>	43.3 <sup>1</sup>	27.02 <sup>30</sup>	40.9 <sup>4</sup>	28.89 <sup>30</sup>	32.0 <sup>4</sup>	39.72 <sup>79</sup>	8.2 <sup>4</sup>
25.6	42.28 <sup>41</sup>	43.3 <sup>1</sup>	27.32 <sup>29</sup>	41.8 <sup>9</sup>	29.19 <sup>30</sup>	31.3 <sup>7</sup>	40.51 <sup>78</sup>	8.1 <sup>3</sup>
Dec. 5.6	42.69 <sup>39</sup>	43.5 <sup>2</sup>	27.61 <sup>28</sup>	43.1 <sup>16</sup>	29.49 <sup>29</sup>	30.3 <sup>11</sup>	41.29 <sup>76</sup>	8.4 <sup>6</sup>
15.5	43.08 <sup>36</sup>	44.0 <sup>5</sup>	27.89 <sup>25</sup>	44.7 <sup>20</sup>	29.78 <sup>29</sup>	29.2 <sup>13</sup>	42.05 <sup>71</sup>	9.0 <sup>11</sup>
25.5	43.44 <sup>32</sup>	44.6 <sup>8</sup>	28.14 <sup>22</sup>	46.7 <sup>23</sup>	30.07 <sup>26</sup>	27.9 <sup>15</sup>	42.76 <sup>66</sup>	10.1 <sup>14</sup>
35.5	43.76 <sup>29</sup>	45.4 <sup>10</sup>	28.36 <sup>19</sup>	49.0 <sup>24</sup>	30.33 <sup>24</sup>	26.4 <sup>16</sup>	43.42 <sup>58</sup>	11.5 <sup>17</sup>
Jan. 0.5	44.05 <sup>23</sup>	46.4 <sup>12</sup>	28.55 <sup>15</sup>	51.4 <sup>26</sup>	30.57 <sup>21</sup>	24.8 <sup>15</sup>	44.00 <sup>50</sup>	13.2 <sup>21</sup>
10.5	44.28 <sup>17</sup>	47.6 <sup>12</sup>	28.70 <sup>10</sup>	54.0 <sup>26</sup>	30.78 <sup>17</sup>	23.3 <sup>15</sup>	44.50 <sup>39</sup>	15.3 <sup>23</sup>
20.4	44.45 <sup>17</sup>	47.6 <sup>12</sup>	28.80 <sup>10</sup>	56.6 <sup>25</sup>	30.95 <sup>13</sup>	21.8 <sup>14</sup>	44.89 <sup>27</sup>	17.6 <sup>24</sup>
30.4				59.1 <sup>25</sup>	31.08 <sup>13</sup>	20.4 <sup>14</sup>	45.16 <sup>27</sup>	20.0 <sup>24</sup>
Sec $\delta$ , Tan $\delta$	1.382	+0.954	1.043	-0.298	1.001	+0.044	2.789	+2.604
Mean Place	36 <sup>s</sup> .961	47 <sup>''</sup> .46	24 <sup>s</sup> .147	55 <sup>''</sup> .77	25 <sup>s</sup> .707	21 <sup>''</sup> .80	32 <sup>s</sup> .874	19 <sup>''</sup> .96
D $\phi$ a, D $\alpha$ a	+0.02	+0.01	-0.01	0.00	0.00	0.00	+0.07	+0.03
D $\phi$ $\delta$ , D $\alpha$ $\delta$	-0.1	+1.0	-0.1	+1.0	-0.1	+1.0	-0.1	+1.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ζ Mensæ. Mag. 5.6		θ Geminorum. Mag. 3.6		α Pictoris. Mag. 3.3		Right Ascension.
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	
	h m 6 46 s	° ' — 80 43 "	h m 6 47 s	° ' + 34 3 "	h m 6 47 s	° ' — 61 50 "	
Jan. 0.5	75.37	23.0	13.75	58.1	22.05	53.5	51.89
10.5	75.07 30	26.5 35	13.88 13	58.7 6	22.04 1	57.2 37	51.92
20.5	74.52 55	30.0 35	13.96 8	59.4 7	21.93 11	60.7 35	51.88
30.4	73.73 79	33.3 33	13.97 1	60.1 7	21.74 19	64.0 33	51.78
Feb. 9.4	72.73 100 118	36.2 29 25	13.93 4 10	60.9 8 7	21.47 27 34	66.9 29 25	51.61
19.4	71.55	38.7	13.83	61.6	21.13	69.4	51.38
Mar. 1.3	70.21 134	40.8 21	13.70 13	62.2 6	20.73 40	71.4 20	51.11
11.3	68.77 144	42.4 16	13.53 17	62.7 5	20.29 44	73.0 16	50.81
21.3	67.26 151	43.5 11	13.34 19	63.1 4	19.83 46	74.0 10	50.49
31.3	65.72 154 154	44.0 5 0	13.14 20 19	63.2 1 0	19.35 48 48	74.5 5 1	50.10
Apr. 10.2	64.18	44.0	12.95	63.2	18.87	74.4	49.89
20.2	62.68 150	43.6 4	12.78 17	63.1 1	18.41 46	73.8 6	49.59
30.2	61.26 142	42.6 10	12.63 15	62.7 4	17.99 42	72.7 11	49.29
May 10.2	59.95 131	41.2 14	12.51 12	62.2 5	17.61 38	71.2 15	48.99
20.1	58.78 117 101	39.3 19 23	12.43 8 3	61.6 6 7	17.28 33 27	69.2 20 24	48.70
30.1	57.77	37.0	12.40	60.9	17.01	66.8	48.60
June 9.1	56.95 82	34.4 26	12.41 1	60.2 7	16.82 19	64.1 27	48.49
19.0	56.33 62	31.5 29	12.47 6	59.4 8	16.69 13	61.1 30	48.49
29.0	55.94 39	28.5 30	12.58 11	58.6 8	16.64 5	57.9 32	48.49
July 9.0	55.78 16 7	25.3 32 32	12.73 15 19	57.8 8 7	16.67 3 11	54.7 32 33	48.49
19.0	55.85	22.1	12.92	57.1	16.78	51.4	48.60
28.9	56.15 30	19.0 31	13.14 22	56.3 8	16.96 18	48.3 31	48.79
Aug. 7.9	56.68 53	16.1 29	13.40 26	55.6 7	17.21 25	45.3 30	48.99
17.9	57.41 73	13.5 26	13.68 28	54.9 7	17.53 32	42.7 26	49.29
27.9	58.34 93 109	11.2 23 18	13.99 31 33	54.3 6 6	17.90 37 43	40.4 23 17	49.59
Sept. 6.8	59.43	9.4	14.32	53.7	18.33	38.7	49.89
16.8	60.64 121	8.2 12	14.66 34	53.1 6	18.79 46	37.5 12	50.29
26.8	61.95 131	7.5 7	15.01 35	52.5 6	19.28 49	36.9 6	50.69
Oct. 6.7	63.29 134	7.5 0	15.38 37	52.0 5	19.79 51	36.9 0	51.09
16.7	64.64 135 129	8.1 6 13	15.75 37 37	51.6 4 4	20.30 51 50	37.6 7 14	51.49
26.7	65.93	9.4	16.12	51.2	20.80	39.0	51.89
Nov. 5.7	67.12 119	11.3 19	16.48 36	50.9 3	21.27 47	41.0 20	52.29
15.6	68.17 105	13.7 24	16.82 34	50.7 2	21.70 43	43.5 25	52.59
25.6	69.03 86	16.5 28	17.15 33	50.6 1	22.07 37	46.5 30	52.89
Dec. 5.6	69.68 65 40	19.8 33 35	17.45 30 26	50.7 1 2	22.37 30 23	49.9 34 36	53.19
15.6	70.08	23.3	17.71	50.9	22.60	53.5	53.39
25.5	70.21 13	27.0 37	17.93 22	51.3 4	22.73 13	57.3 38	53.49
35.5	70.09 12	30.6 36	18.09 16	51.8 5	22.78 5	61.0 37	53.59
Sec δ, Tan δ	6.204	—6.123	1.207	+0.676	2.119	—1.869	1.19
Mean Place	68°.432	30''.15	11°.329	53''.33	19°.240	60''.16	49°.00
D'ψ α, Dω α	—0.16	—0.08	+0.02	+0.01	—0.05	—0.03	—0.00
D'ψ δ, Dω δ	—0.1	+1.0	—0.1	+1.0	—0.1	+1.0	—0.00

APPARENT PLACES OF STARS, 1915.

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FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	15 Lyncis. Mag. 4.5		θ Canis Majoris. Mag. 4.2		ε Canis Majoris. Mag. 1.6		ζ Geminorum. Var. 3.7-4.3	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 6 49	° ' " +58 31	h m 6 50	° ' " -11 55	h m 6 55	° ' " -28 51	h m 6 59	° ' " +20 41
Jan. 0.5	59.11	72.7	16.34	47.2	19.01	14.6	6.27	49.4
10.5	59.28 <sup>17</sup>	74.7 <sup>20</sup>	16.44 <sup>10</sup>	49.4 <sup>22</sup>	19.09 <sup>8</sup>	17.6 <sup>30</sup>	6.40 <sup>13</sup>	49.2
20.5	59.36 <sup>8</sup>	76.7 <sup>20</sup>	16.48 <sup>4</sup>	51.4 <sup>20</sup>	19.12 <sup>3</sup>	20.4 <sup>28</sup>	6.48 <sup>8</sup>	49.1
30.4	59.36 <sup>0</sup>	78.7 <sup>20</sup>	16.47 <sup>1</sup>	53.2 <sup>18</sup>	19.09 <sup>3</sup>	23.0 <sup>26</sup>	6.50 <sup>2</sup>	49.0
Feb. 9.4	59.26 <sup>10</sup>	80.6 <sup>19</sup>	16.42 <sup>5</sup>	54.8 <sup>16</sup>	19.01 <sup>8</sup>	25.3 <sup>23</sup>	6.47 <sup>3</sup>	49.1
	<sup>17</sup>	<sup>17</sup>	<sup>9</sup>	<sup>13</sup>	<sup>12</sup>	<sup>19</sup>	<sup>7</sup>	
19.4	59.09	82.3	16.33	56.1	18.89	27.2	6.40	49.2
Mar. 1.3	58.85 <sup>24</sup>	83.7 <sup>14</sup>	16.20 <sup>13</sup>	57.1 <sup>10</sup>	18.73 <sup>16</sup>	28.7 <sup>15</sup>	6.29 <sup>11</sup>	49.4
11.3	58.56 <sup>29</sup>	84.8 <sup>11</sup>	16.05 <sup>15</sup>	57.8 <sup>7</sup>	18.55 <sup>18</sup>	29.9 <sup>12</sup>	6.15 <sup>14</sup>	49.6
21.3	58.24 <sup>32</sup>	85.5 <sup>7</sup>	15.88 <sup>17</sup>	58.2 <sup>4</sup>	18.34 <sup>21</sup>	30.6 <sup>7</sup>	5.99 <sup>16</sup>	49.8
31.3	57.90 <sup>34</sup>	85.8 <sup>3</sup>	15.70 <sup>18</sup>	58.3 <sup>1</sup>	18.13 <sup>21</sup>	31.0 <sup>4</sup>	5.82 <sup>17</sup>	49.9
	<sup>33</sup>	<sup>1</sup>	<sup>18</sup>	<sup>1</sup>	<sup>21</sup>	<sup>1</sup>	<sup>17</sup>	
Apr. 10.2	57.57	85.7	15.52	58.2	17.92	30.9	5.65	50.0
20.2	57.26 <sup>31</sup>	85.2 <sup>5</sup>	15.36 <sup>16</sup>	57.8 <sup>4</sup>	17.72 <sup>20</sup>	30.4 <sup>5</sup>	5.49 <sup>16</sup>	50.1
30.2	56.99 <sup>27</sup>	84.3 <sup>9</sup>	15.22 <sup>14</sup>	57.1 <sup>7</sup>	17.54 <sup>18</sup>	29.6 <sup>8</sup>	5.35 <sup>14</sup>	50.1
May 10.2	56.77 <sup>22</sup>	83.0 <sup>13</sup>	15.10 <sup>12</sup>	56.2 <sup>9</sup>	17.39 <sup>15</sup>	28.4 <sup>12</sup>	5.25 <sup>10</sup>	50.1
20.1	56.61 <sup>16</sup>	81.5 <sup>15</sup>	15.02 <sup>8</sup>	55.1 <sup>11</sup>	17.27 <sup>12</sup>	26.8 <sup>16</sup>	5.17 <sup>8</sup>	50.1
	<sup>10</sup>	<sup>18</sup>	<sup>4</sup>	<sup>14</sup>	<sup>8</sup>	<sup>19</sup>	<sup>3</sup>	
30.1	56.51	79.7	14.98	53.7	17.19	24.9	5.14	50.0
June 9.1	56.49 <sup>2</sup>	77.8 <sup>19</sup>	14.97 <sup>1</sup>	52.2 <sup>15</sup>	17.15 <sup>4</sup>	22.8 <sup>21</sup>	5.15 <sup>1</sup>	50.0
19.0	56.55 <sup>6</sup>	75.7 <sup>21</sup>	15.00 <sup>3</sup>	50.6 <sup>16</sup>	17.15 <sup>0</sup>	20.5 <sup>23</sup>	5.19 <sup>4</sup>	49.9
29.0	56.67 <sup>12</sup>	73.6 <sup>21</sup>	15.07 <sup>7</sup>	48.8 <sup>18</sup>	17.19 <sup>4</sup>	18.1 <sup>24</sup>	5.27 <sup>8</sup>	49.9
July 9.0	56.86 <sup>19</sup>	71.5 <sup>21</sup>	15.17 <sup>10</sup>	47.0 <sup>18</sup>	17.27 <sup>8</sup>	15.6 <sup>25</sup>	5.40 <sup>13</sup>	49.8
	<sup>26</sup>	<sup>21</sup>	<sup>13</sup>	<sup>18</sup>	<sup>12</sup>	<sup>25</sup>	<sup>16</sup>	
19.0	57.12	69.4	15.30	45.2	17.39	13.1	5.56	49.8
28.9	57.44 <sup>32</sup>	67.4 <sup>20</sup>	15.47 <sup>17</sup>	43.5 <sup>17</sup>	17.55 <sup>16</sup>	10.7 <sup>24</sup>	5.74 <sup>18</sup>	49.8
Aug. 7.9	57.81 <sup>37</sup>	65.6 <sup>18</sup>	15.67 <sup>20</sup>	41.9 <sup>16</sup>	17.74 <sup>19</sup>	8.4 <sup>23</sup>	5.96 <sup>22</sup>	49.7
17.9	58.23 <sup>42</sup>	63.8 <sup>18</sup>	15.89 <sup>22</sup>	40.5 <sup>14</sup>	17.96 <sup>22</sup>	6.4 <sup>20</sup>	6.21 <sup>25</sup>	49.5
27.9	58.68 <sup>45</sup>	62.3 <sup>15</sup>	16.13 <sup>24</sup>	39.4 <sup>11</sup>	18.21 <sup>25</sup>	4.7 <sup>17</sup>	6.47 <sup>26</sup>	49.3
	<sup>50</sup>	<sup>13</sup>	<sup>26</sup>	<sup>8</sup>	<sup>27</sup>	<sup>13</sup>	<sup>28</sup>	
Sept. 6.8	59.18	61.0	16.39	38.6	18.48	3.4	6.75	49.1
16.8	59.70 <sup>52</sup>	59.9 <sup>11</sup>	16.67 <sup>28</sup>	38.1 <sup>5</sup>	18.77 <sup>29</sup>	2.6 <sup>8</sup>	7.05 <sup>30</sup>	48.7
26.8	60.24 <sup>54</sup>	59.1 <sup>8</sup>	16.96 <sup>29</sup>	38.1 <sup>0</sup>	19.08 <sup>31</sup>	2.3 <sup>3</sup>	7.37 <sup>32</sup>	48.2
Oct. 6.7	60.79 <sup>55</sup>	58.5 <sup>6</sup>	17.26 <sup>30</sup>	38.4 <sup>3</sup>	19.39 <sup>31</sup>	2.5 <sup>2</sup>	7.69 <sup>32</sup>	47.7
16.7	61.35 <sup>56</sup>	58.2 <sup>3</sup>	17.56 <sup>30</sup>	39.1 <sup>7</sup>	19.71 <sup>32</sup>	3.2 <sup>7</sup>	8.02 <sup>33</sup>	47.0
	<sup>55</sup>	<sup>0</sup>	<sup>30</sup>	<sup>12</sup>	<sup>32</sup>	<sup>13</sup>	<sup>33</sup>	
26.7	61.90	58.2	17.86	40.3	20.03	4.5	8.35	46.3
Nov. 5.7	62.44 <sup>54</sup>	58.6 <sup>4</sup>	18.15 <sup>29</sup>	41.8 <sup>15</sup>	20.34 <sup>31</sup>	6.2 <sup>17</sup>	8.67 <sup>32</sup>	45.6
15.6	62.96 <sup>52</sup>	59.2 <sup>6</sup>	18.43 <sup>28</sup>	43.6 <sup>18</sup>	20.64 <sup>30</sup>	8.4 <sup>22</sup>	8.99 <sup>32</sup>	44.8
25.6	63.45 <sup>49</sup>	60.2 <sup>10</sup>	18.69 <sup>26</sup>	45.6 <sup>20</sup>	20.91 <sup>27</sup>	11.0 <sup>26</sup>	9.29 <sup>30</sup>	44.0
Dec. 5.6	63.88 <sup>43</sup>	61.4 <sup>12</sup>	18.93 <sup>24</sup>	47.8 <sup>22</sup>	21.15 <sup>24</sup>	13.8 <sup>28</sup>	9.57 <sup>28</sup>	43.3
	<sup>38</sup>	<sup>16</sup>	<sup>20</sup>	<sup>23</sup>	<sup>21</sup>	<sup>30</sup>	<sup>24</sup>	
15.6	64.26	63.0	19.13	50.1	21.36	16.8	9.81	42.7
25.5	64.57 <sup>31</sup>	64.7 <sup>17</sup>	19.30 <sup>17</sup>	52.4 <sup>23</sup>	21.52 <sup>16</sup>	19.8 <sup>30</sup>	10.02 <sup>21</sup>	42.2
35.5	64.79 <sup>22</sup>	66.6 <sup>19</sup>	19.42 <sup>12</sup>	54.7 <sup>23</sup>	21.63 <sup>11</sup>	22.9 <sup>31</sup>	10.18 <sup>16</sup>	41.9
Sec δ, Tan δ	1.916	+1.634	1.022	-0.211	1.142	-0.551	1.069	+0.378
Mean Place	55°.390	68''.08	14°.472	52''.50	17°.102	20''.52	4°.127	45''.29
D <sub>1</sub> α, D <sub>2</sub> α	+0.04	+0.02	-0.01	0.00	-0.01	-0.01	+0.01	+0.01
D <sub>1</sub> δ, D <sub>2</sub> δ	-0.1	+1.0	-0.1	+1.0	-0.1	+1.0	-0.1	+1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♂ Canis Majoris. Mag. 3.1		γ Canis Majoris. Mag. 4.1		δ Canis Majoris. Mag. 2.0		63 Aurigæ. Mag. 5.1	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 6 59 s	° ' " — 23 42 "	h m 6 59 s	° ' " — 15 30 "	h m 7 4 s	° ' " — 26 15 "	h m 7 5 s	° ' " + 39 27 "
Jan. 0.5	30.39	24.3	56.65	19.5	57.94	21.2	51.33	40.3
10.5	30.48 9	27.0 27	56.75 10	21.9 24	58.03 9	24.1 29	51.49 16	41.2 9
20.5	30.52 4	29.6 26	56.80 5	24.1 22	58.07 4	26.9 28	51.59 10	42.2 10
30.4	30.50 2	32.0 24	56.80 0	26.1 20	58.06 1	29.4 25	51.63 4	43.2 10
Feb. 9.4	30.44 6	34.1 21	56.75 5	27.9 18	58.00 6	31.6 22	51.60 3	44.3 11
	11	18	9	15	11	19	9	11
19.4	30.33	35.9	56.66	29.4	57.89	33.5	51.51	45.4
Mar. 1.4	30.19 14	37.3 14	56.53 13	30.6 12	57.74 15	35.1 16	51.38 13	46.3 9
11.3	30.02 17	38.4 11	56.38 15	31.4 8	57.57 17	36.3 12	51.21 17	47.0 7
21.3	29.83 19	39.1 7	56.21 17	32.0 6	57.38 19	37.1 8	51.01 20	47.6 6
31.3	29.63 20	39.4 3	56.02 19	32.2 2	57.17 21	37.5 4	50.80 21	47.9 3
	19	0	18	1	20	0	21	1
Apr. 10.2	29.44	39.4	55.84	32.1	56.97	37.5	50.59	48.0
20.2	29.25 19	39.0 4	55.68 16	31.8 3	56.78 19	37.1 4	50.39 20	47.9 1
30.2	29.09 16	38.2 8	55.53 15	31.1 7	56.60 18	36.3 8	50.22 17	47.6 3
May 10.2	28.95 14	37.1 11	55.40 13	30.1 10	56.45 15	35.2 11	50.08 14	47.1 5
20.1	28.84 11	35.7 14	55.31 9	28.9 12	56.34 11	33.8 14	49.98 10	46.3 8
	8	17	6	14	9	17	6	9
30.1	28.76	34.0	55.25	27.5	56.25	32.1	49.92	45.4
June 9.1	28.73 3	32.1 19	55.23 2	25.9 16	56.21 4	30.1 20	49.91 1	44.5 9
19.1	28.74 1	30.0 21	55.25 2	24.1 18	56.21 0	27.9 22	49.95 4	43.4 11
29.0	28.78 4	27.8 22	55.30 5	22.2 19	56.24 3	25.6 23	50.04 9	42.3 11
July 9.0	28.87 9	25.5 23	55.39 9	20.3 19	56.32 8	23.3 23	50.18 14	41.1 12
	12	23	13	19	11	24	17	12
19.0	28.99	23.2	55.52	18.4	56.43	20.9	50.35	39.9
28.9	29.14 15	21.0 22	55.68 16	16.5 19	56.58 15	18.6 23	50.57 22	38.8 11
Aug. 7.9	29.33 19	18.9 21	55.87 19	14.8 17	56.76 18	16.4 22	50.82 25	37.7 11
17.9	29.54 21	17.0 19	56.08 21	13.3 15	56.97 21	14.5 19	51.11 29	36.6 11
27.9	29.78 24	15.5 15	56.31 23	12.0 13	57.21 24	12.9 16	51.42 31	35.6 10
	26	11	26	9	26	13	33	10
Sept. 6.8	30.04	14.4	56.57	11.1	57.47	11.6	51.75	34.6
16.8	30.32 28	13.6 8	56.84 27	10.5 6	57.75 28	10.8 8	52.11 36	33.7 9
26.8	30.62 30	13.3 3	57.13 29	10.4 1	58.05 30	10.4 4	52.48 37	32.9 8
Oct. 6.8	30.93 31	13.6 3	57.43 30	10.7 3	58.36 31	10.6 2	52.87 39	32.2 7
16.7	31.24 31	14.3 7	57.74 31	11.4 7	58.68 32	11.3 7	53.26 39	31.6 6
	31	12	30	12	32	12	39	5
26.7	31.55	15.5	58.04	12.6	59.00	12.5	53.65	31.1
Nov. 5.7	31.86 31	17.2 17	58.34 30	14.1 15	59.31 31	14.2 17	54.05 40	30.7 4
15.6	32.15 29	19.2 20	58.63 29	16.0 19	59.61 30	16.3 21	54.43 38	30.6 1
25.6	32.42 27	21.6 24	58.90 27	18.1 21	59.89 28	18.7 24	54.79 36	30.6 0
Dec. 5.6	32.67 25	24.3 27	59.14 24	20.5 24	60.14 25	21.5 28	55.12 33	30.8 2
	21	28	21	25	21	29	30	4
15.6	32.88	27.1	59.35	23.0	60.35	24.4	55.42	31.2
25.5	33.04 16	30.0 20	59.53 18	25.5 25	60.52 17	27.3 29	55.67 25	31.8 6
35.5	33.16 12	32.8 28	59.65 12	28.0 25	60.65 13	30.3 30	55.86 19	32.6 8
Sec δ, Tan δ	1.092	— 0.439	1.038	— 0.277	1.115	— 0.493	1.295	+ 0.823
Mean Place	28°.510	30''.00	54°.790	24''.90	56°.055	27''.17	48°.725	37''.06
D'ψ α, Dω α	— 0.01	— 0.01	— 0.01	0.00	— 0.01	— 0.01	+ 0.02	+ 0.02
Dψ δ, Dω δ	— 0.1	+ 1.0	— 0.1	+ 1.0	— 0.1	+ 1.0	— 0.1	+ 1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	51 Geminorum. Mag. 5.3		γ <sup>2</sup> Volantis. Mag. 3.9		λ Geminorum. Mag. 3.6		25 H. Camelop. Mag. 5.1	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 7 8 s	° ' " +16 18 "	h m 7 9 s	° ' " -70 21 "	h m 7 13 s	° ' " +16 41 "	h m 7 13 s	° ' " +82 34 "
Jan. 0.5	31.59	18.7 6	31.79	31.6 38	14.64	44.0 5	30.54	45.2 30
10.5	31.73 <sup>14</sup>	18.1 4	31.79	35.4 37	14.79 <sup>15</sup>	43.5 4	31.11 <sup>57</sup>	48.2 30
20.5	31.81 <sup>8</sup>	17.7 3	31.65 <sup>14</sup>	39.1 35	14.88 <sup>9</sup>	43.1 3	31.33 <sup>22</sup>	51.2 29
30.4	31.85 <sup>4</sup>	17.4 2	31.39 <sup>26</sup>	42.6 28	14.91 <sup>3</sup>	42.8 0	31.20 <sup>13</sup>	54.1 26
Feb. 9.4	31.83 <sup>2</sup>	17.2 1	31.02 <sup>37</sup>	45.8 28	14.90 <sup>1</sup>	42.6 0	30.74 <sup>46</sup>	56.9 26
	7		47		6		77	
19.4	31.76	17.1 1	30.55	48.6 24	14.84	42.6 0	29.97 <sup>104</sup>	59.5 22
Mar. 1.4	31.66 <sup>10</sup>	17.2 0	30.00 <sup>55</sup>	51.0 19	14.74 <sup>10</sup>	42.6 1	28.93 <sup>126</sup>	61.7 17
11.3	31.53 <sup>13</sup>	17.2 1	29.38 <sup>62</sup>	52.9 14	14.61 <sup>13</sup>	42.7 2	27.67 <sup>142</sup>	63.4 12
21.3	31.37 <sup>16</sup>	17.3 2	28.72 <sup>66</sup>	54.3 9	14.45 <sup>16</sup>	42.9 1	26.25 <sup>151</sup>	64.6 6
31.3	31.21 <sup>16</sup>	17.5 1	28.03 <sup>69</sup>	55.2 3	14.29 <sup>16</sup>	43.0 1	24.74 <sup>153</sup>	65.2 0
	17		69		17			
Apr. 10.2	31.04	17.6 1	27.34	55.5 2	14.12	43.1 2	23.21 <sup>149</sup>	65.2 5
20.2	30.89 <sup>15</sup>	17.7 2	26.66 <sup>68</sup>	55.3 7	13.97 <sup>15</sup>	43.3 1	21.72 <sup>138</sup>	64.7 11
30.2	30.75 <sup>14</sup>	17.9 1	26.01 <sup>65</sup>	54.6 12	13.83 <sup>14</sup>	43.4 2	20.34 <sup>123</sup>	63.6 16
May 10.2	30.64 <sup>11</sup>	18.0 2	25.41 <sup>60</sup>	53.4 17	13.72 <sup>11</sup>	43.6 1	19.11 <sup>103</sup>	62.0 21
20.1	30.56 <sup>8</sup>	18.2 1	24.88 <sup>53</sup>	51.7 21	13.64 <sup>8</sup>	43.7 1	18.08 <sup>79</sup>	59.9 24
	4		46		5			
30.1	30.52	18.3 2	24.42	49.6 25	13.59	43.8 2	17.29	57.5 27
June 9.1	30.52 <sup>0</sup>	18.5 1	24.04 <sup>38</sup>	47.1 28	13.59 <sup>0</sup>	44.0 1	16.76 <sup>53</sup>	54.8 29
19.1	30.56 <sup>4</sup>	18.6 2	23.76 <sup>28</sup>	44.3 30	13.62 <sup>3</sup>	44.1 2	16.51 <sup>25</sup>	51.9 31
29.0	30.63 <sup>7</sup>	18.8 2	23.58 <sup>18</sup>	41.3 32	13.69 <sup>7</sup>	44.3 1	16.54 <sup>3</sup>	48.8 31
July 9.0	30.74 <sup>11</sup>	19.0 2	23.51 <sup>7</sup>	38.1 32	13.79 <sup>10</sup>	44.4 2	16.86 <sup>32</sup>	45.7 31
	14		4		14		59	
19.0	30.88	19.2 2	23.55	34.9 32	13.93	44.6 1	17.45 <sup>86</sup>	42.6 31
28.9	31.06 <sup>18</sup>	19.4 1	23.70 <sup>15</sup>	31.7 30	14.11 <sup>18</sup>	44.7 0	18.31 <sup>110</sup>	39.5 28
Aug. 7.9	31.26 <sup>20</sup>	19.5 0	23.95 <sup>25</sup>	28.7 28	14.31 <sup>20</sup>	44.7 0	19.41 <sup>133</sup>	36.7 27
17.9	31.49 <sup>23</sup>	19.5 0	24.31 <sup>36</sup>	25.9 25	14.53 <sup>22</sup>	44.7 1	20.74 <sup>152</sup>	34.0 24
27.9	31.74 <sup>25</sup>	19.5 2	24.75 <sup>44</sup>	23.4 20	14.78 <sup>25</sup>	44.6 2	22.26 <sup>170</sup>	31.6 21
	27		53		27			
Sept. 6.8	32.01	19.3 3	25.28	21.4 15	15.05	44.4 3	23.96 <sup>184</sup>	29.5 17
16.8	32.30 <sup>29</sup>	19.0 5	25.87 <sup>59</sup>	19.9 9	15.33 <sup>28</sup>	44.1 5	25.80 <sup>195</sup>	27.8 14
26.8	32.60 <sup>30</sup>	18.5 6	26.52 <sup>65</sup>	19.0 3	15.63 <sup>30</sup>	43.6 6	27.75 <sup>203</sup>	26.4 9
Oct. 6.8	32.91 <sup>31</sup>	17.9 7	27.20 <sup>68</sup>	18.7 4	15.94 <sup>31</sup>	43.0 8	29.78 <sup>206</sup>	25.0 5
16.7	33.23 <sup>32</sup>	17.2 8	27.89 <sup>69</sup>	19.1 11	16.26 <sup>32</sup>	42.2 8	31.84 <sup>206</sup>	25.0 0
	33		68		33			
26.7	33.56	16.4 9	28.57	20.2 17	16.59	41.4 10	33.90 <sup>202</sup>	25.0 5
Nov. 5.7	33.88 <sup>32</sup>	15.5 10	29.22 <sup>65</sup>	21.9 23	16.91 <sup>32</sup>	40.4 10	35.92 <sup>192</sup>	26.5 14
15.6	34.19 <sup>31</sup>	14.5 10	29.82 <sup>60</sup>	24.2 28	17.23 <sup>32</sup>	39.4 10	37.84 <sup>178</sup>	27.9 19
25.6	34.49 <sup>30</sup>	13.5 9	30.34 <sup>52</sup>	27.0 35	17.53 <sup>30</sup>	38.4 9	39.62 <sup>135</sup>	32.1 26
Dec. 5.6	34.77 <sup>28</sup>	12.5 7	30.77 <sup>43</sup>	30.3 39	17.81 <sup>28</sup>	37.4 7	41.21 <sup>108</sup>	34.7 28
	24		32		25		77	
15.6	35.01	11.6 8	31.09	33.8 37	18.06	36.5 8	42.56	37.5
25.5	35.22 <sup>21</sup>	10.8 8	31.30 <sup>21</sup>	37.5 39	18.27 <sup>21</sup>	35.7 8	43.64 <sup>77</sup>	
35.5	35.38 <sup>16</sup>	10.1 7	31.37 <sup>7</sup>	41.4	18.44 <sup>17</sup>	35.0 7	44.41	
Sec δ, Tan δ	1.042	+0.292	2.975	-2.802	1.044	+0.300	7.743	+7.678
Mean Place	29°.521	14''.88	28°.283	39''.88	12°.571	40''.50	16°.654	42''.85
D <sub>φ</sub> a, D <sub>ω</sub> a	+0.01	+0.01	-0.07	-0.06	+0.01	+0.01	+0.19	+0.16
D <sub>φ</sub> δ, D <sub>ω</sub> δ	-0.1	+1.0	-0.1	+1.0	-0.1	+0.9	-0.1	+0.9

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\pi$ Argus. Mag. 2.7		$\delta$ Geminorum. Mag. 3.5		$\delta$ Volantis. Mag. 4.0		$\epsilon$ Geminorum. Mag. 3.9	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 7 14 s	° ' " - 36 56 "	h m 7 15 s	° ' " + 22 8 "	h m 7 16 s	° ' " - 67 47 "	h m 7 20 s	° ' " + 27 57 "
Jan. 0.5	10.39	33.4	5.07	26.5	56.15	57.6	29.26	67.3
10.5	10.48 9	36.8 34	5.22 15	26.3 2	56.18 3	61.4 38	29.42 16	67.5 2
20.5	10.52 4	39.9 31	5.32 10	26.2 1	56.09 9	65.1 37	29.52 10	67.7 2
30.4	10.49 3	42.9 30	5.36 4	26.2 0	55.89 20	68.7 36	29.57 5	68.1 4
Feb. 9.4	10.41 8	45.6 27	5.35 1	26.4 2	55.59 30	71.9 32	29.57 0	68.6 5
	13	23	6	2	39	29	6	5
19.4	10.28	47.9	5.29	26.6	55.20	74.8	29.51	69.1
Mar. 1.4	10.11 17	49.9 20	5.19 10	26.9 3	54.73 47	77.3 25	29.41 10	69.6 5
	20	15	14	2	53	20	14	5
11.3	9.91 20	51.4 15	5.05 14	27.1 2	54.20 57	79.3 20	29.27 14	70.1 5
21.3	9.68 23	52.4 10	4.89 16	27.4 3	53.63 60	80.8 15	29.10 17	70.5 4
31.3	9.44 24	53.0 6	4.72 17	27.6 2	53.03 60	81.8 10	28.92 18	70.9 4
	24	2	17	2		4	18	2
Apr. 10.3	9.20	53.2	4.55	27.8	52.43	82.2	28.74	71.1
20.2	8.97 23	52.9 3	4.39 16	27.9 1	51.84 59	82.1 1	28.57 17	71.2 1
30.2	8.76 21	52.2 7	4.25 14	28.0 1	51.27 57	81.5 6	28.42 15	71.1 1
May 10.2	8.57 19	51.0 12	4.14 11	28.0 0	50.74 53	80.4 11	28.30 12	71.0 1
20.1	8.42 15	49.5 15	4.05 9	27.9 1	50.27 47	78.8 16	28.21 9	70.7 3
	12	19	4	1	41	21	6	3
30.1	8.30	47.6	4.01	27.8	49.86	76.7	28.15	70.4
June 9.1	8.22 8	45.4 22	4.00 1	27.7 1	49.53 33	74.3 24	28.14 1	70.0 4
19.1	8.18 4	43.0 24	4.03 3	27.5 2	49.28 25	71.6 27	28.16 2	69.5 5
29.0	8.19 1	40.4 26	4.10 7	27.4 1	49.12 16	68.6 30	28.23 7	69.0 5
July 9.0	8.24 5	37.7 27	4.21 11	27.2 2	49.06 6	65.5 31	28.34 11	68.5 5
	10	27	14	2	3	33	14	5
19.0	8.34	35.0	4.35	27.0	49.09	62.2	28.48	68.0
29.0	8.47 13	32.3 27	4.52 17	26.8 2	49.22 13	59.0 32	28.66 18	67.4 6
Aug. 7.9	8.64 17	29.8 25	4.73 21	26.6 2	49.44 22	56.0 30	28.87 21	66.8 6
17.9	8.85 21	27.5 23	4.96 23	26.3 3	49.75 31	53.2 28	29.11 24	66.2 6
27.9	9.10 25	25.5 20	5.22 26	25.9 4	50.14 39	50.7 25	29.37 26	65.5 7
	27	15	28	4	46	21	29	7
Sept. 6.8	9.37	24.0	5.50	25.5	50.60	48.6	29.66	64.8
16.8	9.67 30	22.9 11	5.79 29	25.0 5	51.13 53	47.1 15	29.96 30	64.1 7
26.8	9.99 32	22.3 6	6.10 31	24.4 6	51.71 58	46.1 10	30.28 32	63.4 7
Oct. 6.8	10.32 33	22.3 0	6.42 32	23.7 7	52.32 61	45.8 3	30.62 34	62.6 8
16.7	10.66 34	22.9 6	6.75 33	22.9 8	52.94 62	46.1 3	30.97 35	61.8 8
	34	11	34	8	62	10	35	8
26.7	11.00	24.0	7.09	22.1	53.56	47.1	31.32	61.0
Nov. 5.7	11.34 34	25.8 18	7.42 33	21.3 8	54.16 60	48.7 16	31.67 35	60.2 8
15.7	11.66 32	28.0 22	7.75 33	20.4 9	54.72 56	51.0 23	32.01 34	59.5 7
25.6	11.96 30	30.6 26	8.06 31	19.6 8	55.21 49	53.7 27	32.34 33	58.9 6
Dec. 5.6	12.23 27	33.6 30	8.35 29	18.9 7	55.62 41	56.9 32	32.65 31	58.4 5
	23	32	27	6	32	36	28	3
15.6	12.46	36.8	8.62	18.3	55.94	60.5	32.93	58.1
25.5	12.64 18	40.1 33	8.84 22	17.9 4	56.16 22	64.2 37	33.16 23	57.9 2
35.5	12.77 13	43.5 34	9.02 18	17.5 4	56.26 10	68.0 38	33.35 19	57.9 0
Sec $\delta$ , Tan $\delta$	1.251	-0.752	1.080	+0.407	2.647	-2.451	1.132	+0.531
Mean Place	8 <sup>s</sup> .442	40'' .18	2 <sup>s</sup> .913	23'' .28	52 <sup>s</sup> .998	66'' .13	26 <sup>s</sup> .978	64'' .77
D' $\psi$ $\alpha$ , D <sub>m</sub> $\alpha$	-0.02	-0.02	+0.01	+0.01	-0.06	-0.05	+0.01	+0.01
D $\psi$ $\delta$ , D <sub>m</sub> $\delta$	-0.1	+0.9	-0.1	+0.9	-0.1	+0.9	-0.1	+0.9

FOR THE UPPER TRANSIT AT WASHINGTON.



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\sigma$ Argus. Mag. 3.3		$\alpha^2$ Geminorum. (Castor.) Mag. 2.0		$\beta$ Monocerotis. Mag. 5.2		$\alpha$ Canis Minoris. (Procyon.) Mag. 0.5	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 7 26 s	° ' -43 7 "	h m 7 29 s	° ' +32 4 "	h m 7 33 s	° ' - 3 55 "	h m 7 34 s	° ' + 5 26 "
Jan. 0.5	33.99 <sup>10</sup>	36.1 <sup>36</sup>	13.11 <sup>18</sup>	36.2 <sup>3</sup>	4.95 <sup>14</sup>	8.9 <sup>19</sup>	53.05 <sup>15</sup>	39.7 <sup>14</sup>
10.5	34.09 <sup>4</sup>	39.7 <sup>34</sup>	13.29 <sup>12</sup>	36.5 <sup>5</sup>	5.09 <sup>10</sup>	10.8 <sup>17</sup>	53.20 <sup>10</sup>	38.3 <sup>12</sup>
20.5	34.13 <sup>2</sup>	43.1 <sup>32</sup>	13.41 <sup>6</sup>	37.0 <sup>7</sup>	5.19 <sup>4</sup>	12.5 <sup>15</sup>	53.30 <sup>5</sup>	37.1 <sup>10</sup>
30.5	34.11 <sup>9</sup>	46.3 <sup>30</sup>	13.47 <sup>0</sup>	37.7 <sup>7</sup>	5.23 <sup>1</sup>	14.0 <sup>13</sup>	53.35 <sup>1</sup>	36.1 <sup>8</sup>
Feb. 9.4	34.02 <sup>14</sup>	49.3 <sup>25</sup>	13.47 <sup>6</sup>	38.4 <sup>7</sup>	5.22 <sup>5</sup>	15.3 <sup>11</sup>	53.34 <sup>4</sup>	35.3 <sup>6</sup>
19.4	33.88 <sup>18</sup>	51.8 <sup>22</sup>	13.41 <sup>10</sup>	39.1 <sup>8</sup>	5.17 <sup>9</sup>	16.4 <sup>9</sup>	53.30 <sup>9</sup>	34.7 <sup>5</sup>
Mar. 1.4	33.70 <sup>23</sup>	54.0 <sup>18</sup>	13.31 <sup>14</sup>	39.9 <sup>6</sup>	5.08 <sup>12</sup>	17.3 <sup>6</sup>	53.21 <sup>12</sup>	34.2 <sup>3</sup>
11.3	33.47 <sup>25</sup>	55.8 <sup>13</sup>	13.17 <sup>17</sup>	40.5 <sup>6</sup>	4.96 <sup>15</sup>	17.9 <sup>4</sup>	53.09 <sup>15</sup>	33.9 <sup>2</sup>
21.3	33.22 <sup>26</sup>	57.1 <sup>9</sup>	13.00 <sup>18</sup>	41.1 <sup>4</sup>	4.81 <sup>16</sup>	18.3 <sup>2</sup>	52.94 <sup>15</sup>	33.7 <sup>0</sup>
31.3	32.96 <sup>27</sup>	58.0 <sup>3</sup>	12.82 <sup>18</sup>	41.5 <sup>3</sup>	4.65 <sup>16</sup>	18.5 <sup>0</sup>	52.79 <sup>16</sup>	33.7 <sup>1</sup>
Apr. 10.3	32.69 <sup>26</sup>	58.3 <sup>1</sup>	12.64 <sup>18</sup>	41.8 <sup>1</sup>	4.49 <sup>16</sup>	18.5 <sup>2</sup>	52.63 <sup>16</sup>	33.8 <sup>2</sup>
20.2	32.43 <sup>25</sup>	58.2 <sup>6</sup>	12.46 <sup>17</sup>	41.9 <sup>1</sup>	4.33 <sup>14</sup>	18.3 <sup>4</sup>	52.47 <sup>14</sup>	34.0 <sup>3</sup>
30.2	32.18 <sup>22</sup>	57.6 <sup>11</sup>	12.29 <sup>14</sup>	41.8 <sup>2</sup>	4.19 <sup>12</sup>	17.9 <sup>6</sup>	52.33 <sup>11</sup>	34.3 <sup>4</sup>
May 10.2	31.96 <sup>19</sup>	56.5 <sup>15</sup>	12.15 <sup>10</sup>	41.6 <sup>3</sup>	4.07 <sup>10</sup>	17.3 <sup>7</sup>	52.22 <sup>9</sup>	34.7 <sup>5</sup>
20.2	31.77 <sup>16</sup>	55.0 <sup>18</sup>	12.05 <sup>6</sup>	41.3 <sup>5</sup>	3.97 <sup>6</sup>	16.6 <sup>9</sup>	52.13 <sup>6</sup>	35.2 <sup>5</sup>
30.1	31.61 <sup>11</sup>	53.2 <sup>22</sup>	11.99 <sup>3</sup>	40.8 <sup>6</sup>	3.91 <sup>3</sup>	15.7 <sup>11</sup>	52.07 <sup>3</sup>	35.7 <sup>6</sup>
June 9.1	31.50 <sup>7</sup>	51.0 <sup>25</sup>	11.96 <sup>2</sup>	40.2 <sup>7</sup>	3.88 <sup>0</sup>	14.6 <sup>11</sup>	52.04 <sup>1</sup>	36.3 <sup>7</sup>
19.1	31.43 <sup>2</sup>	48.5 <sup>27</sup>	11.98 <sup>6</sup>	39.5 <sup>7</sup>	3.88 <sup>4</sup>	13.5 <sup>12</sup>	52.05 <sup>4</sup>	37.0 <sup>7</sup>
29.0	31.41 <sup>2</sup>	45.8 <sup>28</sup>	12.04 <sup>10</sup>	38.8 <sup>8</sup>	3.92 <sup>7</sup>	12.3 <sup>13</sup>	52.09 <sup>8</sup>	37.7 <sup>8</sup>
July 9.0	31.43 <sup>8</sup>	43.0 <sup>29</sup>	12.14 <sup>13</sup>	38.0 <sup>8</sup>	3.99 <sup>10</sup>	11.0 <sup>12</sup>	52.17 <sup>12</sup>	38.5 <sup>7</sup>
19.0	31.51 <sup>12</sup>	40.1 <sup>28</sup>	12.27 <sup>18</sup>	37.2 <sup>8</sup>	4.09 <sup>14</sup>	9.8 <sup>12</sup>	52.29 <sup>14</sup>	39.2 <sup>6</sup>
29.0	31.63 <sup>16</sup>	37.3 <sup>27</sup>	12.45 <sup>21</sup>	36.4 <sup>9</sup>	4.23 <sup>16</sup>	8.6 <sup>11</sup>	52.43 <sup>17</sup>	39.8 <sup>6</sup>
Aug. 7.9	31.79 <sup>20</sup>	34.6 <sup>25</sup>	12.66 <sup>24</sup>	35.5 <sup>9</sup>	4.39 <sup>19</sup>	7.5 <sup>10</sup>	52.60 <sup>19</sup>	40.4 <sup>4</sup>
17.9	31.99 <sup>24</sup>	32.1 <sup>22</sup>	12.90 <sup>26</sup>	34.6 <sup>9</sup>	4.58 <sup>21</sup>	6.5 <sup>8</sup>	52.79 <sup>22</sup>	40.8 <sup>3</sup>
27.9	32.23 <sup>28</sup>	29.9 <sup>18</sup>	13.16 <sup>29</sup>	33.7 <sup>9</sup>	4.79 <sup>24</sup>	5.7 <sup>5</sup>	53.01 <sup>24</sup>	41.1 <sup>1</sup>
Sept. 6.9	32.51 <sup>31</sup>	28.1 <sup>13</sup>	13.45 <sup>31</sup>	32.8 <sup>9</sup>	5.03 <sup>26</sup>	5.2 <sup>2</sup>	53.25 <sup>26</sup>	41.2 <sup>1</sup>
16.8	32.82 <sup>33</sup>	26.8 <sup>8</sup>	13.76 <sup>33</sup>	31.9 <sup>9</sup>	5.29 <sup>27</sup>	5.0 <sup>0</sup>	53.51 <sup>28</sup>	41.1 <sup>4</sup>
26.8	33.15 <sup>35</sup>	26.0 <sup>1</sup>	14.09 <sup>35</sup>	31.0 <sup>9</sup>	5.56 <sup>29</sup>	5.0 <sup>4</sup>	53.79 <sup>29</sup>	40.7 <sup>6</sup>
Oct. 6.8	33.50 <sup>37</sup>	25.9 <sup>4</sup>	14.44 <sup>36</sup>	30.1 <sup>9</sup>	5.85 <sup>30</sup>	5.4 <sup>8</sup>	54.08 <sup>31</sup>	40.1 <sup>8</sup>
16.7	33.87 <sup>37</sup>	26.3 <sup>10</sup>	14.80 <sup>36</sup>	29.2 <sup>8</sup>	6.15 <sup>30</sup>	6.2 <sup>10</sup>	54.39 <sup>31</sup>	39.3 <sup>11</sup>
26.7	34.24 <sup>36</sup>	27.3 <sup>16</sup>	15.16 <sup>37</sup>	28.4 <sup>8</sup>	6.45 <sup>31</sup>	7.2 <sup>14</sup>	54.70 <sup>31</sup>	38.2 <sup>13</sup>
Nov. 5.7	34.60 <sup>35</sup>	28.9 <sup>22</sup>	15.53 <sup>36</sup>	27.6 <sup>7</sup>	6.76 <sup>31</sup>	8.6 <sup>16</sup>	55.01 <sup>30</sup>	36.9 <sup>14</sup>
15.7	34.95 <sup>33</sup>	31.1 <sup>27</sup>	15.89 <sup>35</sup>	26.9 <sup>5</sup>	7.07 <sup>29</sup>	10.2 <sup>18</sup>	55.31 <sup>30</sup>	35.5 <sup>16</sup>
25.6	35.28 <sup>29</sup>	33.8 <sup>30</sup>	16.24 <sup>32</sup>	26.4 <sup>3</sup>	7.36 <sup>27</sup>	12.0 <sup>20</sup>	55.61 <sup>28</sup>	33.9 <sup>16</sup>
Dec. 5.6	35.57 <sup>25</sup>	36.8 <sup>33</sup>	16.56 <sup>30</sup>	26.1 <sup>2</sup>	7.63 <sup>24</sup>	14.0 <sup>20</sup>	55.89 <sup>25</sup>	32.3 <sup>16</sup>
15.6	35.82 <sup>19</sup>	40.1 <sup>35</sup>	16.86 <sup>25</sup>	25.9 <sup>0</sup>	7.87 <sup>21</sup>	16.0 <sup>20</sup>	56.14 <sup>21</sup>	30.7 <sup>16</sup>
25.6	36.01 <sup>14</sup>	43.6 <sup>36</sup>	17.11 <sup>21</sup>	25.9 <sup>2</sup>	8.08 <sup>17</sup>	18.0 <sup>20</sup>	56.35 <sup>18</sup>	29.1 <sup>14</sup>
35.5	36.15	47.2	17.32	26.1	8.25	20.0	56.53	27.7
Sec $\delta$ , Tan $\delta$	1.370	-0.937	1.180	+0.627	1.002	-0.069	1.005	+0.095
Mean Place	31 <sup>h</sup> .996	43 <sup>m</sup> .66	10 <sup>h</sup> .736	34 <sup>m</sup> .45	3 <sup>h</sup> .100	13 <sup>m</sup> .16	51 <sup>h</sup> .192	36 <sup>m</sup> .57
D <sup>'</sup> $\delta$ , D <sub>0</sub> $\delta$	-0.02	-0.02	+0.02	+0.02	0.00	0.00	0.00	0.00
D <sub>1</sub> $\delta$ , D <sub>2</sub> $\delta$	-0.1	+0.9	-0.2	+0.9	-0.2	+0.9	-0.2	+0.9

FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	24 Lyncis. Mag. 5.0		κ Geminorum. Mag. 3.7		β Geminorum. (Pollux.) Mag. 1.2		4 Puppis. Mag. 5.1	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 7 35 s	° ' " +58 54 "	h m 7 39 s	° ' " +24 36 "	h m 7 40 s	° ' " +28 13 "	h m 7 42 s	° ' " -14 21 "
n. 0.5	53.19 <sup>26</sup>	37.9 <sup>18</sup>	21.31 <sup>18</sup>	11.2 <sup>1</sup>	9.29 <sup>18</sup>	57.9 <sup>1</sup>	3.83 <sup>14</sup>	18.2 <sup>24</sup>
10.5	53.45 <sup>16</sup>	39.7 <sup>20</sup>	21.49 <sup>12</sup>	11.1 <sup>0</sup>	9.47 <sup>13</sup>	58.0 <sup>2</sup>	3.97 <sup>9</sup>	20.6 <sup>24</sup>
20.5	53.61 <sup>8</sup>	41.7 <sup>21</sup>	21.61 <sup>7</sup>	11.1 <sup>1</sup>	9.60 <sup>7</sup>	58.2 <sup>4</sup>	4.06 <sup>5</sup>	23.0 <sup>21</sup>
30.5	53.69 <sup>2</sup>	43.8 <sup>21</sup>	21.68 <sup>1</sup>	11.2 <sup>3</sup>	9.67 <sup>5</sup>	58.6 <sup>6</sup>	4.11 <sup>6</sup>	25.1 <sup>19</sup>
b. 9.4	53.67 <sup>11</sup>	45.9 <sup>20</sup>	21.69 <sup>4</sup>	11.5 <sup>4</sup>	9.68 <sup>5</sup>	59.1 <sup>6</sup>	4.10 <sup>6</sup>	27.0 <sup>16</sup>
19.4	53.56 <sup>18</sup>	47.9 <sup>18</sup>	21.65 <sup>8</sup>	11.9 <sup>4</sup>	9.63 <sup>8</sup>	59.7 <sup>6</sup>	4.04 <sup>9</sup>	28.6 <sup>13</sup>
r. 1.4	53.38 <sup>25</sup>	49.7 <sup>15</sup>	21.57 <sup>12</sup>	12.3 <sup>4</sup>	9.55 <sup>13</sup>	60.3 <sup>5</sup>	3.95 <sup>13</sup>	29.9 <sup>11</sup>
11.4	53.13 <sup>30</sup>	51.2 <sup>12</sup>	21.45 <sup>15</sup>	12.7 <sup>5</sup>	9.42 <sup>16</sup>	60.8 <sup>6</sup>	3.82 <sup>15</sup>	31.0 <sup>7</sup>
21.3	52.83 <sup>32</sup>	52.4 <sup>8</sup>	21.30 <sup>17</sup>	13.2 <sup>3</sup>	9.26 <sup>18</sup>	61.4 <sup>3</sup>	3.67 <sup>17</sup>	31.7 <sup>1</sup>
31.3	52.51 <sup>34</sup>	53.2 <sup>4</sup>	21.13 <sup>17</sup>	13.5 <sup>3</sup>	9.09 <sup>18</sup>	61.8 <sup>3</sup>	3.50 <sup>17</sup>	32.2 <sup>1</sup>
r. 10.3	52.17 <sup>32</sup>	53.6 <sup>0</sup>	20.96 <sup>17</sup>	13.8 <sup>2</sup>	8.91 <sup>17</sup>	62.1 <sup>2</sup>	3.33 <sup>17</sup>	32.3 <sup>1</sup>
20.2	51.85 <sup>31</sup>	53.6 <sup>5</sup>	20.79 <sup>15</sup>	14.0 <sup>1</sup>	8.74 <sup>16</sup>	62.3 <sup>1</sup>	3.16 <sup>15</sup>	32.2 <sup>4</sup>
30.2	51.54 <sup>27</sup>	53.1 <sup>8</sup>	20.64 <sup>12</sup>	14.1 <sup>0</sup>	8.58 <sup>13</sup>	62.4 <sup>1</sup>	3.01 <sup>14</sup>	31.8 <sup>7</sup>
y 10.2	51.27 <sup>21</sup>	52.3 <sup>12</sup>	20.52 <sup>10</sup>	14.1 <sup>0</sup>	8.45 <sup>11</sup>	62.3 <sup>2</sup>	2.87 <sup>11</sup>	31.1 <sup>10</sup>
20.2	51.06 <sup>17</sup>	51.1 <sup>15</sup>	20.42 <sup>7</sup>	14.1 <sup>2</sup>	8.34 <sup>7</sup>	62.1 <sup>3</sup>	2.76 <sup>8</sup>	30.1 <sup>11</sup>
30.1	50.89 <sup>9</sup>	49.6 <sup>17</sup>	20.35 <sup>3</sup>	13.9 <sup>2</sup>	8.27 <sup>3</sup>	61.8 <sup>4</sup>	2.68 <sup>5</sup>	29.0 <sup>14</sup>
ne 9.1	50.80 <sup>3</sup>	47.9 <sup>20</sup>	20.32 <sup>1</sup>	13.7 <sup>3</sup>	8.24 <sup>1</sup>	61.4 <sup>4</sup>	2.63 <sup>1</sup>	27.6 <sup>15</sup>
19.1	50.77 <sup>4</sup>	45.9 <sup>21</sup>	20.33 <sup>5</sup>	13.4 <sup>3</sup>	8.25 <sup>4</sup>	61.0 <sup>6</sup>	2.62 <sup>2</sup>	26.1 <sup>17</sup>
29.1	50.81 <sup>11</sup>	43.8 <sup>23</sup>	20.38 <sup>9</sup>	13.1 <sup>4</sup>	8.29 <sup>8</sup>	60.4 <sup>5</sup>	2.64 <sup>5</sup>	24.4 <sup>17</sup>
ly 9.0	50.92 <sup>18</sup>	41.5 <sup>22</sup>	20.47 <sup>12</sup>	12.7 <sup>4</sup>	8.37 <sup>13</sup>	59.9 <sup>6</sup>	2.69 <sup>9</sup>	22.7 <sup>18</sup>
19.0	51.10 <sup>24</sup>	39.3 <sup>23</sup>	20.59 <sup>15</sup>	12.3 <sup>4</sup>	8.50 <sup>15</sup>	59.3 <sup>7</sup>	2.78 <sup>12</sup>	20.9 <sup>17</sup>
29.0	51.34 <sup>29</sup>	37.0 <sup>23</sup>	20.74 <sup>19</sup>	11.9 <sup>5</sup>	8.65 <sup>19</sup>	58.6 <sup>7</sup>	2.90 <sup>15</sup>	19.2 <sup>16</sup>
ig. 7.9	51.63 <sup>35</sup>	34.7 <sup>21</sup>	20.93 <sup>21</sup>	11.4 <sup>6</sup>	8.84 <sup>22</sup>	57.9 <sup>8</sup>	3.05 <sup>17</sup>	17.6 <sup>15</sup>
17.9	51.98 <sup>40</sup>	32.6 <sup>20</sup>	21.14 <sup>24</sup>	10.8 <sup>6</sup>	9.06 <sup>25</sup>	57.1 <sup>8</sup>	3.22 <sup>21</sup>	16.1 <sup>12</sup>
27.9	52.38 <sup>44</sup>	30.6 <sup>19</sup>	21.38 <sup>27</sup>	10.2 <sup>7</sup>	9.31 <sup>27</sup>	56.3 <sup>8</sup>	3.43 <sup>23</sup>	14.9 <sup>9</sup>
pt. 6.9	52.82 <sup>48</sup>	28.7 <sup>17</sup>	21.65 <sup>28</sup>	9.5 <sup>7</sup>	9.58 <sup>29</sup>	55.5 <sup>9</sup>	3.66 <sup>25</sup>	14.0 <sup>6</sup>
16.8	53.30 <sup>51</sup>	27.0 <sup>15</sup>	21.93 <sup>30</sup>	8.8 <sup>9</sup>	9.87 <sup>31</sup>	54.6 <sup>9</sup>	3.91 <sup>27</sup>	13.4 <sup>2</sup>
26.8	53.81 <sup>53</sup>	25.5 <sup>12</sup>	22.23 <sup>32</sup>	7.9 <sup>9</sup>	10.18 <sup>33</sup>	53.7 <sup>9</sup>	4.18 <sup>29</sup>	13.2 <sup>2</sup>
ct. 6.8	54.34 <sup>56</sup>	24.3 <sup>10</sup>	22.55 <sup>34</sup>	7.0 <sup>9</sup>	10.51 <sup>35</sup>	52.8 <sup>10</sup>	4.47 <sup>30</sup>	13.4 <sup>6</sup>
16.8	54.90 <sup>56</sup>	23.3 <sup>6</sup>	22.89 <sup>34</sup>	6.1 <sup>10</sup>	10.86 <sup>35</sup>	51.8 <sup>10</sup>	4.77 <sup>31</sup>	14.0 <sup>11</sup>
26.7	55.46 <sup>57</sup>	22.7 <sup>3</sup>	23.23 <sup>34</sup>	5.1 <sup>10</sup>	11.21 <sup>35</sup>	50.8 <sup>9</sup>	5.08 <sup>31</sup>	15.1 <sup>14</sup>
ov. 5.7	56.03 <sup>55</sup>	22.4 <sup>0</sup>	23.57 <sup>35</sup>	4.1 <sup>9</sup>	11.56 <sup>35</sup>	49.9 <sup>9</sup>	5.39 <sup>31</sup>	16.5 <sup>18</sup>
15.7	56.58 <sup>53</sup>	22.4 <sup>8</sup>	23.92 <sup>31</sup>	3.2 <sup>8</sup>	11.91 <sup>33</sup>	49.0 <sup>7</sup>	5.70 <sup>30</sup>	18.3 <sup>21</sup>
25.6	57.11 <sup>50</sup>	22.8 <sup>11</sup>	24.25 <sup>29</sup>	2.3 <sup>6</sup>	12.25 <sup>29</sup>	48.3 <sup>5</sup>	6.00 <sup>25</sup>	20.4 <sup>25</sup>
ec. 5.6	57.61 <sup>44</sup>	23.6 <sup>11</sup>	24.56 <sup>29</sup>	1.5 <sup>6</sup>	12.58 <sup>29</sup>	47.7 <sup>5</sup>	6.27 <sup>25</sup>	22.7 <sup>25</sup>
15.6	58.05 <sup>38</sup>	24.7 <sup>14</sup>	24.85 <sup>25</sup>	0.9 <sup>5</sup>	12.87 <sup>25</sup>	47.2 <sup>2</sup>	6.52 <sup>21</sup>	25.2 <sup>26</sup>
25.6	58.43 <sup>31</sup>	26.1 <sup>17</sup>	25.10 <sup>20</sup>	0.4 <sup>3</sup>	13.12 <sup>21</sup>	47.0 <sup>1</sup>	6.73 <sup>17</sup>	27.8 <sup>25</sup>
35.5	58.74 <sup>31</sup>	27.8 <sup>17</sup>	25.30 <sup>20</sup>	0.1 <sup>3</sup>	13.33 <sup>21</sup>	46.9 <sup>1</sup>	6.90 <sup>17</sup>	30.3 <sup>25</sup>
δ, Tan δ m Place	1.937 49°.392	+1.658 37''.89	1.100 19°.122	+0.458 9''.66	1.135 7°.018	+0.537 56''.71	1.032 2°.035	-0.256 23''.32
α, D <sub>α</sub> α	+0.04	+0.04	+0.01	+0.01	+0.01	+0.02	-0.01	-0.01
δ, D <sub>δ</sub> δ	-0.2	+0.9	-0.2	+0.9	-0.2	+0.9	-0.2	+0.9



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ξ Argus. Mag. 3.5		φ Geminorum. Mag. 5.0		26 Lyncis. Mag. 5.7		Groombridge Mag. 5	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	
	h m 7 45 s	° ' - 24 38 "	h m 7 48 s	° ' + 26 59 "	h m 7 48 s	° ' + 47 46 "	h m 7 50 s	
Jan. 0.5	44.95	38.5	20.11	13.2	34.73	68.9	9.63	
10.5	45.09 <sup>14</sup>	41.4 <sup>29</sup>	20.30 <sup>19</sup>	13.2 <sup>0</sup>	34.97 <sup>24</sup>	70.1 <sup>12</sup>	10.08 <sup>45</sup>	
20.5	45.18 <sup>9</sup>	44.2 <sup>28</sup>	20.44 <sup>14</sup>	13.3 <sup>1</sup>	35.13 <sup>16</sup>	71.5 <sup>14</sup>	10.36 <sup>28</sup>	
30.5	45.21 <sup>3</sup>	46.9 <sup>27</sup>	20.51 <sup>7</sup>	13.6 <sup>3</sup>	35.22 <sup>9</sup>	73.0 <sup>15</sup>	10.47 <sup>11</sup>	
Feb. 9.4	45.19 <sup>2</sup> 6	49.3 <sup>24</sup> 21	20.54 <sup>3</sup> 3	14.0 <sup>4</sup> 6	35.24 <sup>2</sup> 6	74.6 <sup>16</sup> 16	10.42 <sup>5</sup> 22	
19.4	45.13 <sup>11</sup>	51.4 <sup>18</sup>	20.51 <sup>8</sup>	14.6 <sup>5</sup>	35.18 <sup>11</sup>	76.2 <sup>14</sup>	10.20 <sup>36</sup>	
Mar. 1.4	45.02 <sup>14</sup>	53.2 <sup>14</sup>	20.43 <sup>12</sup>	15.1 <sup>6</sup>	35.07 <sup>17</sup>	77.6 <sup>13</sup>	9.84 <sup>49</sup>	
11.4	44.88 <sup>17</sup>	54.6 <sup>10</sup>	20.31 <sup>15</sup>	15.7 <sup>5</sup>	34.90 <sup>21</sup>	78.9 <sup>11</sup>	9.35 <sup>58</sup>	
21.3	44.71 <sup>19</sup>	55.6 <sup>7</sup>	20.16 <sup>16</sup>	16.2 <sup>5</sup>	34.69 <sup>23</sup>	80.0 <sup>8</sup>	8.77 <sup>65</sup>	
31.3	44.52 <sup>19</sup>	56.3 <sup>3</sup>	20.00 <sup>18</sup>	16.7 <sup>3</sup>	34.46 <sup>24</sup>	80.8 <sup>5</sup>	8.12 <sup>68</sup>	
Apr. 10.3	44.33 <sup>19</sup>	56.6 <sup>0</sup>	19.82 <sup>17</sup>	17.0 <sup>2</sup>	34.22 <sup>24</sup>	81.3 <sup>2</sup>	7.44 <sup>68</sup>	
20.2	44.14 <sup>17</sup>	56.6 <sup>4</sup>	19.65 <sup>15</sup>	17.2 <sup>1</sup>	33.98 <sup>22</sup>	81.5 <sup>1</sup>	6.76 <sup>65</sup>	
30.2	43.97 <sup>16</sup>	56.2 <sup>8</sup>	19.50 <sup>14</sup>	17.3 <sup>1</sup>	33.76 <sup>20</sup>	81.4 <sup>5</sup>	6.11 <sup>59</sup>	
May 10.2	43.81 <sup>13</sup> 10	55.4 <sup>11</sup> 14	19.36 <sup>11</sup> 7	17.4 <sup>2</sup> 2	33.56 <sup>16</sup> 12	80.9 <sup>7</sup> 11	5.52 <sup>52</sup> 42	
20.2	43.68 <sup>10</sup>	54.3 <sup>14</sup>	19.25 <sup>7</sup>	17.2 <sup>2</sup>	33.40 <sup>12</sup>	80.2 <sup>11</sup>	5.00 <sup>42</sup>	
30.1	43.58 <sup>7</sup>	52.9 <sup>16</sup>	19.18 <sup>4</sup>	17.0 <sup>3</sup>	33.28 <sup>7</sup>	79.1 <sup>12</sup>	4.58 <sup>31</sup>	
June 9.1	43.51 <sup>4</sup>	51.3 <sup>19</sup>	19.14 <sup>0</sup>	16.7 <sup>4</sup>	33.21 <sup>2</sup>	77.9 <sup>14</sup>	4.27 <sup>18</sup>	
19.1	43.47 <sup>0</sup>	49.4 <sup>20</sup>	19.14 <sup>4</sup>	16.3 <sup>5</sup>	33.19 <sup>4</sup>	76.5 <sup>15</sup>	4.09 <sup>5</sup>	
29.1	43.47 <sup>4</sup> 8	47.4 <sup>22</sup> 22	19.18 <sup>8</sup> 11	15.8 <sup>5</sup> 5	33.23 <sup>8</sup> 13	75.0 <sup>17</sup> 18	4.04 <sup>7</sup> 20	
July 9.0	43.51 <sup>8</sup>	45.2 <sup>22</sup>	19.26 <sup>11</sup>	15.3 <sup>5</sup>	33.31 <sup>13</sup>	73.3 <sup>18</sup>	4.11 <sup>20</sup>	
19.0	43.59 <sup>11</sup>	43.0 <sup>22</sup>	19.37 <sup>15</sup>	14.8 <sup>6</sup>	33.44 <sup>18</sup>	71.5 <sup>18</sup>	4.31 <sup>32</sup>	
29.0	43.70 <sup>14</sup>	40.8 <sup>21</sup>	19.52 <sup>18</sup>	14.2 <sup>7</sup>	33.62 <sup>23</sup>	69.7 <sup>18</sup>	4.63 <sup>45</sup>	
Aug. 7.9	43.84 <sup>17</sup>	38.7 <sup>19</sup>	19.70 <sup>21</sup>	13.5 <sup>8</sup>	33.85 <sup>26</sup>	67.9 <sup>17</sup>	5.08 <sup>55</sup>	
17.9	44.01 <sup>21</sup>	36.8 <sup>16</sup>	19.91 <sup>24</sup>	12.7 <sup>7</sup>	34.11 <sup>30</sup>	66.2 <sup>17</sup>	5.63 <sup>65</sup>	
27.9	44.22 <sup>23</sup>	35.2 <sup>13</sup>	20.15 <sup>26</sup>	12.0 <sup>9</sup>	34.41 <sup>34</sup>	64.5 <sup>17</sup>	6.28 <sup>75</sup>	
Sept. 6.9	44.45 <sup>25</sup>	33.9 <sup>10</sup>	20.41 <sup>29</sup>	11.1 <sup>9</sup>	34.75 <sup>37</sup>	62.8 <sup>16</sup>	7.03 <sup>82</sup>	
16.8	44.70 <sup>28</sup>	32.9 <sup>4</sup>	20.70 <sup>30</sup>	10.2 <sup>9</sup>	35.12 <sup>39</sup>	61.2 <sup>14</sup>	7.85 <sup>89</sup>	
26.8	44.98 <sup>30</sup>	32.5 <sup>0</sup>	21.00 <sup>32</sup>	9.3 <sup>10</sup>	35.51 <sup>42</sup>	59.8 <sup>13</sup>	8.74 <sup>94</sup>	
Oct. 6.8	45.28 <sup>31</sup> 32	32.5 <sup>5</sup> 10	21.32 <sup>34</sup> 35	8.3 <sup>11</sup> 10	35.93 <sup>43</sup> 45	58.5 <sup>11</sup> 9	9.68 <sup>98</sup> 101	
16.8	45.59 <sup>32</sup>	33.0 <sup>10</sup>	21.66 <sup>35</sup>	7.2 <sup>10</sup>	36.36 <sup>45</sup>	57.4 <sup>9</sup>	10.66 <sup>101</sup>	
26.7	45.91 <sup>33</sup>	34.0 <sup>15</sup>	22.01 <sup>35</sup>	6.2 <sup>10</sup>	36.81 <sup>45</sup>	56.5 <sup>7</sup>	11.67 <sup>100</sup>	
Nov. 5.7	46.24 <sup>31</sup>	35.5 <sup>19</sup>	22.36 <sup>35</sup>	5.2 <sup>10</sup>	37.26 <sup>45</sup>	55.8 <sup>4</sup>	12.67 <sup>99</sup>	
15.7	46.55 <sup>31</sup>	37.4 <sup>23</sup>	22.71 <sup>34</sup>	4.2 <sup>8</sup>	37.71 <sup>43</sup>	55.4 <sup>2</sup>	13.66 <sup>95</sup>	
25.6	46.86 <sup>28</sup> 25	39.7 <sup>26</sup> 28	23.05 <sup>30</sup> 21	3.4 <sup>5</sup> 2	38.14 <sup>38</sup> 27	55.2 <sup>5</sup> 11	14.61 <sup>87</sup> 79	
Dec. 5.6	47.14 <sup>25</sup>	42.3 <sup>28</sup>	23.38 <sup>30</sup>	2.6 <sup>5</sup>	38.55 <sup>38</sup>	55.4 <sup>5</sup>	15.48 <sup>79</sup>	
15.6	47.39 <sup>22</sup>	45.1 <sup>30</sup>	23.68 <sup>26</sup>	2.1 <sup>4</sup>	38.93 <sup>33</sup>	55.9 <sup>7</sup>	16.27 <sup>67</sup>	
25.6	47.61 <sup>17</sup>	48.1 <sup>29</sup>	23.94 <sup>21</sup>	1.7 <sup>2</sup>	39.26 <sup>27</sup>	56.6 <sup>11</sup>	16.94 <sup>53</sup>	
35.5	47.78 <sup>17</sup>	51.0 <sup>29</sup>	24.15 <sup>21</sup>	1.5 <sup>2</sup>	39.53 <sup>27</sup>	57.7 <sup>11</sup>	17.47 <sup>53</sup>	
Sec δ, Tan δ	1.100	-0.459	1.122	+0.509	1.488	+1.102	3.660	
Mean Place	43°.165	44''.72	17°.882	12''.46	31°.771	69''.69	2°.805	
D'ψ a, D <sub>∞</sub> a	-0.01	-0.01	+0.01	+0.02	+0.03	+0.03	+0.08	
D'ψ δ, D <sub>∞</sub> δ	-0.2	+0.9	-0.2	+0.9	-0.2	+0.9	-0.2	

FOR THE UPPER TRANSIT AT

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\rho$ Argus. Mag. 2.9		$\delta$ H. Ursæ Majoris. Mag. 5.5		$\gamma$ Argus. Mag. 2.2		$\zeta$ Cancri ( <i>mean</i> ) Mag. 4.7	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	<div>h m</div> <div>8 3</div>	<div>° '</div> <div>— 24 3</div>	<div>h m</div> <div>8 4</div>	<div>° '</div> <div>+ 68 43</div>	<div>h m</div> <div>8 6</div>	<div>° '</div> <div>— 47 4</div>	<div>h m</div> <div>8 7</div>	<div>° '</div> <div>+ 17 5</div>
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
Jan. 0.6	57.16	24.4	27.43	29.3	56.75	59.5	22.38	18.7
10.5	57.32 <sup>16</sup>	27.3 <sup>29</sup>	27.82 <sup>39</sup>	31.5 <sup>22</sup>	56.91 <sup>16</sup>	63.2 <sup>37</sup>	22.57 <sup>19</sup>	18.0
20.5	57.43 <sup>11</sup>	30.2 <sup>29</sup>	28.09 <sup>27</sup>	33.9 <sup>24</sup>	57.00 <sup>9</sup>	66.8 <sup>36</sup>	22.72 <sup>15</sup>	17.5
30.5	57.48 <sup>5</sup>	32.9 <sup>27</sup>	28.24 <sup>15</sup>	36.4 <sup>25</sup>	57.02 <sup>2</sup>	70.3 <sup>35</sup>	22.81 <sup>9</sup>	17.2
Feb. 9.5	57.49 <sup>1</sup>	35.3 <sup>24</sup>	28.25 <sup>1</sup>	38.9 <sup>25</sup>	56.98 <sup>4</sup>	73.7 <sup>34</sup>	22.85 <sup>4</sup>	17.1
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
19.4	57.44 <sup>5</sup>	37.5 <sup>22</sup>	28.14 <sup>11</sup>	41.4 <sup>25</sup>	56.87 <sup>11</sup>	76.7 <sup>30</sup>	22.84 <sup>1</sup>	17.1
Mar. 1.4	57.35 <sup>9</sup>	39.4 <sup>19</sup>	27.91 <sup>23</sup>	43.6 <sup>22</sup>	56.71 <sup>16</sup>	79.4 <sup>27</sup>	22.78 <sup>6</sup>	17.2
11.4	57.22 <sup>13</sup>	40.9 <sup>15</sup>	27.58 <sup>33</sup>	45.6 <sup>20</sup>	56.51 <sup>20</sup>	81.6 <sup>22</sup>	22.68 <sup>10</sup>	17.5
21.3	57.06 <sup>16</sup>	42.0 <sup>11</sup>	27.18 <sup>40</sup>	47.3 <sup>17</sup>	56.27 <sup>24</sup>	83.5 <sup>19</sup>	22.56 <sup>12</sup>	17.8
31.3	56.89 <sup>17</sup>	42.8 <sup>8</sup>	26.73 <sup>45</sup>	48.5 <sup>12</sup>	56.00 <sup>27</sup>	84.9 <sup>14</sup>	22.41 <sup>15</sup>	18.1
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
Apr. 10.3	56.70 <sup>19</sup>	43.3 <sup>5</sup>	26.24 <sup>49</sup>	49.2 <sup>7</sup>	55.72 <sup>28</sup>	85.7 <sup>8</sup>	22.25 <sup>16</sup>	18.4
20.3	56.52 <sup>18</sup>	43.4 <sup>1</sup>	25.74 <sup>50</sup>	49.5 <sup>3</sup>	55.44 <sup>28</sup>	86.1 <sup>4</sup>	22.10 <sup>15</sup>	18.7
30.2	56.35 <sup>17</sup>	43.1 <sup>3</sup>	25.26 <sup>48</sup>	49.2 <sup>3</sup>	55.17 <sup>27</sup>	86.0 <sup>1</sup>	21.95 <sup>15</sup>	18.9
May 10.2	56.19 <sup>16</sup>	42.4 <sup>7</sup>	24.82 <sup>44</sup>	48.5 <sup>7</sup>	54.92 <sup>25</sup>	85.5 <sup>5</sup>	21.82 <sup>13</sup>	19.2
20.2	56.05 <sup>14</sup>	41.5 <sup>9</sup>	24.43 <sup>39</sup>	47.3 <sup>12</sup>	54.68 <sup>24</sup>	84.5 <sup>10</sup>	21.71 <sup>11</sup>	19.3
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
30.2	55.94 <sup>11</sup>	40.2 <sup>13</sup>	24.12 <sup>31</sup>	45.7 <sup>16</sup>	54.48 <sup>20</sup>	83.0 <sup>15</sup>	21.63 <sup>8</sup>	19.5
June 9.1	55.86 <sup>8</sup>	38.7 <sup>15</sup>	23.88 <sup>24</sup>	43.8 <sup>19</sup>	54.32 <sup>16</sup>	81.1 <sup>19</sup>	21.59 <sup>4</sup>	19.6
19.1	55.81 <sup>5</sup>	37.0 <sup>17</sup>	23.73 <sup>15</sup>	41.5 <sup>23</sup>	54.20 <sup>12</sup>	78.9 <sup>22</sup>	21.58 <sup>1</sup>	19.6
29.1	55.80 <sup>1</sup>	35.0 <sup>20</sup>	23.68 <sup>5</sup>	39.1 <sup>24</sup>	54.12 <sup>8</sup>	76.5 <sup>24</sup>	21.60 <sup>2</sup>	19.7
July 9.0	55.82 <sup>2</sup>	33.0 <sup>20</sup>	23.72 <sup>4</sup>	36.4 <sup>27</sup>	54.09 <sup>3</sup>	73.8 <sup>27</sup>	21.65 <sup>5</sup>	19.6
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
19.0	55.88 <sup>6</sup>	30.9 <sup>21</sup>	23.72 <sup>14</sup>	33.6 <sup>28</sup>	54.09 <sup>1</sup>	70.9 <sup>29</sup>	21.65 <sup>9</sup>	19.6
29.0	55.88	28.8 <sup>21</sup>	23.86	30.8 <sup>28</sup>	54.10	68.1 <sup>28</sup>	21.74	19.6
Aug. 8.0	55.97 <sup>9</sup>	26.7 <sup>21</sup>	24.08 <sup>22</sup>	28.0 <sup>28</sup>	54.17 <sup>7</sup>	65.3 <sup>28</sup>	21.86 <sup>12</sup>	19.4
17.9	56.09 <sup>12</sup>	24.8 <sup>19</sup>	24.40 <sup>32</sup>	25.3 <sup>27</sup>	54.28 <sup>11</sup>	62.6 <sup>27</sup>	22.01 <sup>15</sup>	19.2
27.9	56.25 <sup>16</sup>	23.2 <sup>16</sup>	24.80 <sup>40</sup>	22.7 <sup>26</sup>	54.44 <sup>16</sup>	60.2 <sup>24</sup>	22.19 <sup>18</sup>	18.9
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
Sept. 6.9	56.44 <sup>19</sup>	21.9 <sup>13</sup>	25.27 <sup>47</sup>	20.2 <sup>25</sup>	54.65 <sup>21</sup>	58.1 <sup>21</sup>	22.39 <sup>20</sup>	18.5
16.9	56.66 <sup>22</sup>	20.9 <sup>10</sup>	25.81 <sup>54</sup>	18.0 <sup>22</sup>	54.25	56.4 <sup>28</sup>	22.62 <sup>23</sup>	17.9
26.8	56.90 <sup>24</sup>	20.4 <sup>5</sup>	26.42 <sup>61</sup>	16.0 <sup>20</sup>	54.90	55.3 <sup>17</sup>	22.87 <sup>25</sup>	17.2
Oct. 6.8	57.17 <sup>27</sup>	20.3 <sup>1</sup>	27.08 <sup>66</sup>	14.3 <sup>17</sup>	55.19 <sup>29</sup>	54.7 <sup>11</sup>	23.15 <sup>28</sup>	16.4
16.8	57.46 <sup>29</sup>	20.7 <sup>4</sup>	27.79 <sup>71</sup>	12.9 <sup>14</sup>	55.51 <sup>32</sup>	54.7 <sup>6</sup>	23.45 <sup>30</sup>	15.4
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
26.7	57.77 <sup>31</sup>	21.6 <sup>9</sup>	28.53 <sup>74</sup>	12.0 <sup>9</sup>	55.87 <sup>36</sup>	55.3 <sup>11</sup>	23.76 <sup>31</sup>	14.3
Nov. 5.7	57.77 <sup>32</sup>	23.1 <sup>15</sup>	29.30 <sup>77</sup>	11.4 <sup>6</sup>	56.25 <sup>38</sup>	56.6 <sup>13</sup>	24.09 <sup>33</sup>	13.2
15.7	58.09	24.9 <sup>18</sup>	29.30	11.3 <sup>1</sup>	56.64	58.4 <sup>18</sup>	24.42 <sup>33</sup>	11.9
25.7	58.41 <sup>32</sup>	27.1 <sup>22</sup>	30.07 <sup>77</sup>	11.6 <sup>3</sup>	57.04 <sup>40</sup>	60.8 <sup>24</sup>	24.75 <sup>33</sup>	10.6
Dec. 5.6	58.74 <sup>33</sup>	29.7 <sup>26</sup>	30.84 <sup>77</sup>	12.4 <sup>12</sup>	57.43 <sup>39</sup>	63.7 <sup>29</sup>	25.08 <sup>33</sup>	9.3
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
15.6	59.05 <sup>31</sup>	32.5 <sup>29</sup>	31.59 <sup>75</sup>	13.6 <sup>16</sup>	57.80 <sup>37</sup>	66.9 <sup>35</sup>	25.40 <sup>32</sup>	7.0
25.6	59.34 <sup>29</sup>	35.4 <sup>30</sup>	32.30 <sup>71</sup>	15.2 <sup>19</sup>	58.15 <sup>35</sup>	70.4 <sup>36</sup>	25.69 <sup>26</sup>	6.0
35.5	59.61 <sup>27</sup>	38.4 <sup>30</sup>	32.94 <sup>64</sup>	17.1 <sup>19</sup>	58.45 <sup>30</sup>	74.0 <sup>36</sup>	25.95 <sup>22</sup>	5.2
	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>	<div>s</div>	<div>"</div>
15.6	59.84 <sup>23</sup>	32.5 <sup>29</sup>	32.94 <sup>64</sup>	13.6 <sup>16</sup>	58.45 <sup>30</sup>	66.9 <sup>35</sup>	25.69 <sup>26</sup>	7.0
25.6	59.84 <sup>23</sup>	35.4 <sup>30</sup>	33.49 <sup>55</sup>	15.2 <sup>19</sup>	58.71 <sup>26</sup>	70.4 <sup>36</sup>	25.95 <sup>22</sup>	6.0
35.5	60.03 <sup>19</sup>	38.4 <sup>30</sup>	33.95 <sup>46</sup>	17.1 <sup>19</sup>	58.90 <sup>19</sup>	74.0 <sup>36</sup>	26.17 <sup>22</sup>	5.2
Sec $\delta$ , Tan $\delta$	1.095	—0.446	2.756	+2.568	1.469	—1.076	1.051	+0.323
Mean Place	55°.427	30''.65	22°.221	32''.57	54°.847	68''.66	20°.353	18''.16
D' $\phi$ a, D $\omega$ a	—0.01	—0.02	+0.06	+0.09	—0.02	—0.04	+0.01	+0.01
D $\phi$ $\delta$ , D $\omega$ $\delta$	—0.2	+0.9	—0.2	+0.9	—0.2	+0.9	—0.2	+0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

n Solar date.	Bradley 1147. Mag. 5.7		20 Puppis. Mag. 5.0		β Cancri. Mag. 3.8		31 Lyncis. Mag. 4.4	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 8 8	° ' +76 0	h m 8 9	° ' -15 31	h m 8 11	° ' + 9 26	h m 8 17	° ' +43 27
	s	"	s	"	s	"	s	"
1. 0.6	61.44	60.7	27.28	48.0	56.30	55.3	4.12	39.5
10.5	62.00 56	63.1 24	27.45 17	50.6 26	56.49 19	54.1 12	4.37 25	40.3 8
20.5	62.37 37	65.7 26	27.57 12	53.1 25	56.63 14	53.1 10	4.57 20	41.3 10
30.5	62.56 19	68.5 28	27.64 7	55.4 23	56.72 9	52.2 9	4.69 12	42.5 12
b. 9.5	62.56 0	71.3 28	27.66 2	57.4 20	56.76 4	51.6 6	4.74 5	43.9 14
	19	27	3	18	1	5	1	14
19.4	62.37	74.0	27.63	59.2	56.75	51.1	4.73	45.3
tr. 1.4	62.01 36	76.5 25	27.55 8	60.7 15	56.70 5	50.8 3	4.66 7	46.7 14
11.4	61.50 51	78.7 22	27.45 10	62.0 13	56.61 9	50.7 1	4.54 12	48.1 14
21.3	60.88 62	80.5 18	27.31 14	62.9 9	56.48 13	50.7 0	4.37 17	49.2 11
31.3	60.17 71	81.8 13	27.15 16	63.5 6	56.34 14	50.8 1	4.17 20	50.2 10
	76	8	16	3	15	2	21	7
tr. 10.3	59.41	82.6	26.99	63.8	56.19	51.0	3.96	50.9
20.3	58.63 78	82.8 2	26.82 17	63.8 0	56.04 15	51.2 2	3.74 22	51.4 5
30.2	57.87 76	82.5 3	26.66 16	63.5 3	55.90 14	51.5 3	3.54 20	51.6 2
ay 10.2	57.16 71	81.7 8	26.52 14	62.9 6	55.77 13	51.8 3	3.35 19	51.4 2
20.2	56.53 63	80.4 13	26.40 12	62.1 8	55.67 10	52.2 4	3.19 16	51.0 4
	54	18	10	10	8	4	13	7
30.2	55.99	78.6	26.30	61.1	55.59	52.6	3.06	50.3
ne 9.1	55.57 42	76.5 21	26.24 6	59.8 13	55.54 5	53.1 5	2.97 9	49.4 9
19.1	55.29 28	74.0 25	26.20 4	58.4 14	55.52 2	53.5 4	2.93 4	48.3 11
29.1	55.14 15	71.3 27	26.19 1	56.8 16	55.54 2	54.0 5	2.93 0	47.0 13
ily 9.0	55.14 0	68.4 29	26.23 4	55.1 17	55.58 4	54.4 4	2.98 5	45.6 14
	13	30	6	17	8	4	9	16
19.0	55.27	65.4	26.29	53.4	55.66	54.8	3.07	44.0
29.0	55.55 28	62.3 31	26.38 9	51.7 17	55.77 11	55.1 3	3.21 14	42.4 16
ug. 8.0	55.96 41	59.2 31	26.50 12	50.0 17	55.91 14	55.4 3	3.38 17	40.6 18
17.9	56.51 55	56.2 30	26.65 15	48.6 14	56.07 16	55.6 2	3.59 21	38.9 17
27.9	57.17 66	53.3 29	26.84 19	47.3 13	56.26 19	55.5 1	3.84 25	37.2 17
	77	26	21	10	22	1	29	18
pt. 6.9	57.94	50.7	27.05	46.3	56.48	55.4	4.13	35.4
16.9	58.80 86	48.2 25	27.28 23	45.6 7	56.72 24	55.0 4	4.44 31	33.7 17
26.8	59.75 95	46.1 21	27.54 26	45.3 3	56.98 26	54.5 5	4.78 34	32.1 16
t. 6.8	60.78 103	44.3 18	27.82 28	45.5 2	57.27 29	53.7 8	5.16 38	30.5 16
16.8	61.85 107	42.9 14	28.12 30	46.0 5	57.56 29	52.7 10	5.55 39	29.1 14
	111	10	30	10	32	12	41	13
26.7	62.96	41.9	28.42	47.0	57.88	51.5	5.96	27.8
iv. 5.7	64.09 113	41.4 5	28.74 32	48.4 14	58.20 32	50.2 13	6.38 42	26.7 11
15.7	65.20 111	41.4 0	29.06 32	50.2 18	58.53 33	48.8 14	6.80 42	25.8 9
25.7	66.28 108	41.8 4	29.37 31	52.2 20	58.84 31	47.2 16	7.22 42	25.2 6
xc. 5.6	67.30 102	42.8 10	29.66 29	54.6 24	59.15 31	45.6 16	7.63 41	24.9 3
	92	14	27	25	28	15	37	0
15.6	68.22	44.2	29.93	57.1	59.43	44.1	8.00	24.9
25.6	69.02 80	46.0 18	30.17 24	59.7 26	59.69 26	42.6 15	8.34 34	25.2 3
35.6	69.67 65	48.3 23	30.37 20	62.3 26	59.90 21	41.3 13	8.63 29	25.8 6
δ, Tan δ m Place	4.139 53°.844	+4.016 64''.57	1.038 25°.556	-0.278 53''.12	1.014 54°.404	+0.166 53''.87	1.378 1°.414	+0.948 42''.48
Δ, D <sub>0</sub> Δ	+0.09	+0.14	-0.01	-0.01	0.00	+0.01	+0.02	+0.04
δ, D <sub>0</sub> δ	-0.2	+0.8	-0.2	+0.8	-0.2	+0.8	-0.2	+0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	<i>d</i> <sup>1</sup> Cancrī. Mag. 5.9		<i>ε</i> Argūs. Mag. 1.7		30 Monocerotis. Mag. 4.0		<i>θ</i> Chamæ Mag.
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.
	<div>h m</div> <div>8 18</div> <div>s</div>	<div>° '</div> <div>+18 36</div> <div>"</div>	<div>h m</div> <div>8 20</div> <div>s</div>	<div>° '</div> <div>−59 13</div> <div>"</div>	<div>h m</div> <div>8 21</div> <div>s</div>	<div>° '</div> <div>− 3 37</div> <div>"</div>	<div>h m</div> <div>8 23</div> <div>s</div>
Jan. 0.6	31.95	21.0	48.39	57.5	26.62	39.1	16.54
10.5	32.16 <sup>21</sup>	20.3 <sup>7</sup>	48.58 <sup>19</sup>	61.4 <sup>39</sup>	26.81 <sup>19</sup>	41.1 <sup>20</sup>	16.81 <sup>27</sup>
20.5	32.32 <sup>16</sup>	19.8 <sup>5</sup>	48.68 <sup>10</sup>	65.2 <sup>38</sup>	26.95 <sup>14</sup>	43.0 <sup>19</sup>	16.88 <sup>7</sup>
30.5	32.42 <sup>10</sup>	19.5 <sup>3</sup>	48.69 <sup>1</sup>	69.0 <sup>38</sup>	27.04 <sup>9</sup>	44.6 <sup>16</sup>	16.77 <sup>11</sup>
Feb. 9.5	32.47 <sup>5</sup> <sub>0</sub>	19.4 <sup>1</sup> <sub>1</sub>	48.62 <sup>7</sup> <sub>15</sub>	72.7 <sup>37</sup> <sub>34</sub>	27.08 <sup>4</sup> <sub>1</sub>	46.1 <sup>15</sup> <sub>12</sub>	16.47 <sup>30</sup> <sub>46</sub>
19.4	32.47	19.5	48.47	76.1	27.07	47.3	16.01
Mar. 1.4	32.42 <sup>5</sup>	19.7 <sup>2</sup>	48.25 <sup>22</sup>	79.2 <sup>31</sup>	27.02 <sup>5</sup>	48.3 <sup>10</sup>	15.40 <sup>61</sup>
11.4	32.33 <sup>9</sup>	20.0 <sup>3</sup>	47.97 <sup>28</sup>	81.8 <sup>26</sup>	26.93 <sup>9</sup>	49.0 <sup>7</sup>	14.65 <sup>75</sup>
21.4	32.21 <sup>12</sup>	20.3 <sup>3</sup>	47.64 <sup>33</sup>	84.1 <sup>23</sup>	26.81 <sup>12</sup>	49.5 <sup>5</sup>	13.80 <sup>85</sup>
31.3	32.07 <sup>14</sup> <sub>16</sub>	20.7 <sup>4</sup> <sub>3</sub>	47.27 <sup>37</sup> <sub>38</sub>	85.9 <sup>18</sup> <sub>12</sub>	26.67 <sup>14</sup> <sub>14</sub>	49.8 <sup>3</sup> <sub>1</sub>	12.87 <sup>93</sup> <sub>99</sub>
Apr. 10.3	31.91	21.0	46.89	87.1	26.53	49.9	11.88
20.3	31.76 <sup>15</sup>	21.4 <sup>4</sup>	46.49 <sup>40</sup>	87.9 <sup>8</sup>	26.38 <sup>15</sup>	49.8 <sup>1</sup>	10.86 <sup>102</sup>
30.2	31.61 <sup>15</sup>	21.7 <sup>3</sup>	46.10 <sup>39</sup>	88.1 <sup>2</sup>	26.23 <sup>15</sup>	49.5 <sup>3</sup>	9.84 <sup>102</sup>
May 10.2	31.48 <sup>13</sup>	21.9 <sup>2</sup>	45.72 <sup>38</sup>	87.8 <sup>3</sup>	26.10 <sup>13</sup>	49.1 <sup>4</sup>	8.84 <sup>100</sup>
20.2	31.37 <sup>11</sup> <sub>9</sub>	22.1 <sup>2</sup> <sub>2</sub>	45.37 <sup>35</sup> <sub>32</sub>	87.0 <sup>8</sup> <sub>12</sub>	25.99 <sup>11</sup> <sub>9</sub>	48.5 <sup>6</sup> <sub>8</sub>	7.88 <sup>90</sup> <sub>89</sub>
30.2	31.28	22.3	45.05	85.8	25.90	47.7	6.99
June 9.1	31.23 <sup>5</sup>	22.3 <sup>0</sup>	44.78 <sup>27</sup>	84.0 <sup>18</sup>	25.84 <sup>6</sup>	46.9 <sup>8</sup>	6.18 <sup>81</sup>
19.1	31.21 <sup>2</sup>	22.4 <sup>1</sup>	44.55 <sup>23</sup>	81.9 <sup>21</sup>	25.81 <sup>3</sup>	45.9 <sup>10</sup>	5.48 <sup>70</sup>
29.1	31.22 <sup>1</sup>	22.3 <sup>1</sup>	44.38 <sup>17</sup>	79.4 <sup>25</sup>	25.81 <sup>0</sup>	44.9 <sup>10</sup>	4.91 <sup>57</sup>
July 9.1	31.26 <sup>4</sup> <sub>8</sub>	22.3 <sup>0</sup> <sub>2</sub>	44.27 <sup>11</sup> <sub>5</sub>	76.7 <sup>27</sup> <sub>30</sub>	25.84 <sup>3</sup> <sub>6</sub>	43.8 <sup>11</sup> <sub>11</sub>	4.47 <sup>44</sup> <sub>28</sub>
19.0	31.34	22.1	44.22	73.7	25.90	42.7	4.19
29.0	31.45 <sup>11</sup>	21.9 <sup>2</sup>	44.24 <sup>2</sup>	70.7 <sup>30</sup>	25.99 <sup>9</sup>	41.6 <sup>11</sup>	4.07 <sup>12</sup>
Aug. 8.0	31.59 <sup>14</sup>	21.6 <sup>3</sup>	44.32 <sup>8</sup>	67.6 <sup>31</sup>	26.10 <sup>11</sup>	40.6 <sup>10</sup>	4.11 <sup>4</sup>
17.9	31.75 <sup>16</sup>	21.2 <sup>4</sup>	44.48 <sup>16</sup>	64.7 <sup>29</sup>	26.25 <sup>15</sup>	39.8 <sup>8</sup>	4.32 <sup>21</sup>
27.9	31.95 <sup>20</sup> <sub>22</sub>	20.7 <sup>5</sup> <sub>6</sub>	44.70 <sup>22</sup> <sub>28</sub>	62.0 <sup>27</sup> <sub>25</sub>	26.43 <sup>18</sup> <sub>20</sub>	39.1 <sup>7</sup> <sub>4</sub>	4.70 <sup>38</sup> <sub>53</sub>
Sept. 6.9	32.17	20.1	44.98	59.5	26.63	38.7	5.23
16.9	32.42 <sup>25</sup>	19.3 <sup>8</sup>	45.32 <sup>34</sup>	57.5 <sup>20</sup>	26.85 <sup>22</sup>	38.5 <sup>2</sup>	5.91 <sup>68</sup>
26.8	32.69 <sup>27</sup>	18.4 <sup>9</sup>	45.71 <sup>39</sup>	56.0 <sup>15</sup>	27.10 <sup>25</sup>	38.6 <sup>1</sup>	6.72 <sup>81</sup>
Oct. 6.8	32.98 <sup>29</sup>	17.4 <sup>10</sup>	46.15 <sup>44</sup>	55.0 <sup>10</sup>	27.37 <sup>27</sup>	39.0 <sup>4</sup>	7.63 <sup>91</sup>
16.8	33.29 <sup>31</sup> <sub>32</sub>	16.3 <sup>11</sup> <sub>13</sub>	46.62 <sup>47</sup> <sub>49</sub>	54.7 <sup>3</sup> <sub>3</sub>	27.66 <sup>29</sup> <sub>31</sub>	39.8 <sup>8</sup> <sub>11</sub>	8.62 <sup>99</sup> <sub>102</sub>
26.8	33.61	15.0	47.11	55.0	27.97	40.9	9.64
Nov. 5.7	33.94 <sup>33</sup>	13.7 <sup>13</sup>	47.61 <sup>50</sup>	56.0 <sup>10</sup>	28.28 <sup>31</sup>	42.3 <sup>14</sup>	10.67 <sup>103</sup>
15.7	34.28 <sup>34</sup>	12.3 <sup>14</sup>	48.10 <sup>49</sup>	57.7 <sup>17</sup>	28.60 <sup>32</sup>	43.9 <sup>16</sup>	11.68 <sup>101</sup>
25.7	34.62 <sup>34</sup>	11.0 <sup>13</sup>	48.57 <sup>47</sup>	59.9 <sup>22</sup>	28.91 <sup>31</sup>	45.8 <sup>19</sup>	12.62 <sup>94</sup>
Dec. 5.6	34.94 <sup>32</sup> <sub>30</sub>	9.7 <sup>13</sup> <sub>12</sub>	49.01 <sup>44</sup> <sub>38</sub>	62.7 <sup>28</sup> <sub>31</sub>	29.21 <sup>30</sup> <sub>28</sub>	47.8 <sup>20</sup> <sub>21</sub>	13.46 <sup>84</sup> <sub>71</sub>
15.6	35.24	8.5	49.39	65.8	29.49	49.9	14.17
25.6	35.51 <sup>27</sup>	7.5 <sup>10</sup>	49.70 <sup>31</sup>	69.4 <sup>36</sup>	29.75 <sup>26</sup>	52.0 <sup>21</sup>	14.73 <sup>56</sup>
35.6	35.75 <sup>24</sup>	6.7 <sup>8</sup>	49.94 <sup>24</sup>	73.1 <sup>37</sup>	29.96 <sup>21</sup>	54.1 <sup>21</sup>	15.11 <sup>38</sup>
Sec <i>δ</i> , Tan <i>δ</i>	1.055	+0.337	1.955	−1.680	1.002	−0.063	4.517
Mean Place	29 <sup>h</sup> .938	21 <sup>''</sup> .16	46 <sup>h</sup> .247	68 <sup>''</sup> .47	24 <sup>h</sup> .869	42 <sup>''</sup> .18	12 <sup>h</sup> .619 3
<i>D</i> ' <i>α</i> , <i>D</i> <sub>∞</sub> <i>α</i>	+0.01	+0.01	−0.04	−0.06	0.00	0.00	−0.09
<i>D</i> ' <i>δ</i> , <i>D</i> <sub>∞</sub> <i>δ</i>	−0.2	+0.8	−0.2	+0.8	−0.2	+0.8	−0.2

FOR THE UPPER TRANSIT AT WASHINGTON.

in Solar Date.	O Ursæ Majoris. Mag. 3.5		Groombridge 1450. Mag. 6.0		η Cancri. Mag. 5.5		Groombridge 1446. Mag. 6.3	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 8 23 s 16.84	° ' + 60 59 " 67.6	h m 8 27 s 26.19	° ' + 38 18 " 28.3	h m 8 27 s 49.79	° ' + 20 43 " 49.3	h m 8 30 s 23.78	° ' + 73 55 " 35.0
l. O.6	16.84	67.6	26.19	28.3	49.79	49.3	23.78	35.0
IO.5	17.19 <sup>35</sup>	69.3 <sup>17</sup>	26.45 <sup>26</sup>	28.7 <sup>4</sup>	50.01 <sup>22</sup>	48.7 <sup>6</sup>	24.34 <sup>56</sup>	37.2 <sup>22</sup>
20.5	17.45 <sup>26</sup>	71.2 <sup>19</sup>	26.64 <sup>19</sup>	29.4 <sup>7</sup>	50.18 <sup>17</sup>	48.3 <sup>4</sup>	24.75 <sup>41</sup>	39.7 <sup>25</sup>
30.5	17.61 <sup>16</sup>	73.3 <sup>21</sup>	26.77 <sup>13</sup>	30.3 <sup>9</sup>	50.29 <sup>11</sup>	48.2 <sup>1</sup>	24.99 <sup>24</sup>	42.4 <sup>27</sup>
o. 9.5	17.68 <sup>7</sup>	75.6 <sup>23</sup>	26.84 <sup>7</sup>	31.4 <sup>11</sup>	50.35 <sup>6</sup>	48.2 <sup>0</sup>	25.07 <sup>8</sup>	45.1 <sup>27</sup>
	4	22	0	11	1	1	9	27
19.4	17.64	77.8	26.84	32.5	50.36	48.3	24.98	47.8
r. 1.4	17.52 <sup>12</sup>	80.0 <sup>22</sup>	26.79 <sup>5</sup>	33.7 <sup>12</sup>	50.32 <sup>4</sup>	48.6 <sup>3</sup>	24.74 <sup>24</sup>	50.4 <sup>26</sup>
11.4	17.32 <sup>20</sup>	81.9 <sup>19</sup>	26.69 <sup>10</sup>	34.9 <sup>12</sup>	50.24 <sup>8</sup>	49.0 <sup>4</sup>	24.36 <sup>38</sup>	52.7 <sup>23</sup>
21.4	17.05 <sup>27</sup>	83.6 <sup>17</sup>	26.54 <sup>15</sup>	36.0 <sup>11</sup>	50.12 <sup>12</sup>	49.5 <sup>5</sup>	23.87 <sup>49</sup>	54.6 <sup>19</sup>
31.3	16.73 <sup>32</sup>	84.9 <sup>13</sup>	26.37 <sup>17</sup>	36.9 <sup>9</sup>	49.98 <sup>14</sup>	49.9 <sup>4</sup>	23.29 <sup>58</sup>	56.1 <sup>15</sup>
	34	9	19	8	15	5	64	11
r. 10.3	16.39	85.8	26.18	37.7	49.83	50.4	22.65	57.2
20.3	16.04 <sup>35</sup>	86.3 <sup>5</sup>	25.98 <sup>20</sup>	38.2 <sup>5</sup>	49.67 <sup>16</sup>	50.8 <sup>4</sup>	21.99 <sup>66</sup>	57.7 <sup>5</sup>
30.2	15.70 <sup>34</sup>	86.4 <sup>1</sup>	25.79 <sup>19</sup>	38.5 <sup>3</sup>	49.52 <sup>15</sup>	51.1 <sup>3</sup>	21.33 <sup>66</sup>	57.7 <sup>0</sup>
ay 10.2	15.38 <sup>32</sup>	86.0 <sup>4</sup>	25.62 <sup>17</sup>	38.5 <sup>0</sup>	49.39 <sup>13</sup>	51.4 <sup>3</sup>	20.70 <sup>63</sup>	57.2 <sup>5</sup>
20.2	15.09 <sup>29</sup>	85.2 <sup>8</sup>	25.47 <sup>15</sup>	38.3 <sup>2</sup>	49.27 <sup>12</sup>	51.5 <sup>1</sup>	20.12 <sup>58</sup>	56.2 <sup>10</sup>
	24	12	12	5	9	1	50	15
30.2	14.85	84.0	25.35	37.8	49.18	51.6	19.62	54.7
ne 9.1	14.67 <sup>18</sup>	82.5 <sup>15</sup>	25.27 <sup>8</sup>	37.2 <sup>6</sup>	49.12 <sup>6</sup>	51.6 <sup>0</sup>	19.22 <sup>40</sup>	52.8 <sup>19</sup>
19.1	14.56 <sup>11</sup>	80.6 <sup>19</sup>	25.23 <sup>4</sup>	36.3 <sup>9</sup>	49.09 <sup>3</sup>	51.6 <sup>0</sup>	18.92 <sup>30</sup>	50.5 <sup>23</sup>
29.1	14.51 <sup>5</sup>	78.5 <sup>21</sup>	25.22 <sup>1</sup>	35.3 <sup>10</sup>	49.09 <sup>0</sup>	51.5 <sup>1</sup>	18.73 <sup>19</sup>	48.0 <sup>25</sup>
ly 9.1	14.52 <sup>1</sup>	76.3 <sup>22</sup>	25.26 <sup>4</sup>	34.1 <sup>12</sup>	49.13 <sup>4</sup>	51.3 <sup>2</sup>	18.67 <sup>6</sup>	45.2 <sup>28</sup>
	9	25	8	12	6	3	6	30
19.0	14.61	73.8	25.34	32.9	49.19	51.0	18.73	42.2
29.0	14.76 <sup>15</sup>	71.3 <sup>25</sup>	25.45 <sup>11</sup>	31.5 <sup>14</sup>	49.29 <sup>10</sup>	50.6 <sup>4</sup>	18.90 <sup>17</sup>	39.2 <sup>30</sup>
ug. 8.0	14.98 <sup>22</sup>	68.7 <sup>26</sup>	25.60 <sup>15</sup>	30.0 <sup>15</sup>	49.42 <sup>13</sup>	50.2 <sup>4</sup>	19.20 <sup>30</sup>	36.1 <sup>31</sup>
17.9	15.25 <sup>27</sup>	66.1 <sup>26</sup>	25.79 <sup>19</sup>	28.5 <sup>15</sup>	49.58 <sup>16</sup>	49.6 <sup>6</sup>	19.60 <sup>40</sup>	33.0 <sup>31</sup>
27.9	15.59 <sup>34</sup>	63.6 <sup>25</sup>	26.01 <sup>22</sup>	26.9 <sup>16</sup>	49.77 <sup>19</sup>	49.0 <sup>6</sup>	20.12 <sup>52</sup>	30.0 <sup>30</sup>
	39	24	26	16	22	8	61	29
ept. 6.9	15.98	61.2	26.27	25.3	49.99	48.2	20.73	27.1
16.9	16.41 <sup>43</sup>	58.9 <sup>23</sup>	26.55 <sup>28</sup>	23.7 <sup>16</sup>	50.23 <sup>24</sup>	47.3 <sup>9</sup>	21.43 <sup>70</sup>	24.5 <sup>26</sup>
26.8	16.90 <sup>49</sup>	56.8 <sup>21</sup>	26.86 <sup>31</sup>	22.1 <sup>16</sup>	50.50 <sup>27</sup>	46.3 <sup>10</sup>	22.22 <sup>79</sup>	22.1 <sup>24</sup>
ct. 6.8	17.42 <sup>52</sup>	54.9 <sup>19</sup>	27.20 <sup>34</sup>	20.5 <sup>16</sup>	50.79 <sup>29</sup>	45.2 <sup>11</sup>	23.08 <sup>86</sup>	20.0 <sup>21</sup>
16.8	17.97 <sup>55</sup>	53.3 <sup>16</sup>	27.56 <sup>36</sup>	19.0 <sup>15</sup>	51.10 <sup>31</sup>	43.9 <sup>13</sup>	23.99 <sup>91</sup>	18.3 <sup>17</sup>
	58	14	38	14	33	13	95	13
26.8	18.55	51.9	27.94	17.6	51.43	42.6	24.94	17.0
ov. 5.7	19.15 <sup>60</sup>	51.0 <sup>9</sup>	28.34 <sup>40</sup>	16.3 <sup>13</sup>	51.77 <sup>34</sup>	41.2 <sup>14</sup>	25.92 <sup>98</sup>	16.1 <sup>9</sup>
15.7	19.74 <sup>59</sup>	50.4 <sup>6</sup>	28.74 <sup>40</sup>	15.3 <sup>10</sup>	52.11 <sup>34</sup>	39.8 <sup>14</sup>	26.91 <sup>99</sup>	15.6 <sup>5</sup>
25.7	20.33 <sup>59</sup>	50.2 <sup>2</sup>	29.13 <sup>39</sup>	14.4 <sup>9</sup>	52.45 <sup>34</sup>	38.4 <sup>14</sup>	27.88 <sup>97</sup>	15.7 <sup>1</sup>
ec. 5.6	20.90 <sup>57</sup>	50.5 <sup>3</sup>	29.51 <sup>38</sup>	13.8 <sup>6</sup>	52.79 <sup>34</sup>	37.2 <sup>12</sup>	28.80 <sup>92</sup>	16.3 <sup>6</sup>
	52	7	36	4	31	11	86	11
15.6	21.42	51.2	29.87	13.4	53.10	36.1	29.66	17.4
25.6	21.89 <sup>47</sup>	52.2 <sup>10</sup>	30.20 <sup>33</sup>	13.4 <sup>0</sup>	53.38 <sup>28</sup>	35.1 <sup>10</sup>	30.42 <sup>76</sup>	18.9 <sup>15</sup>
35.6	22.29 <sup>40</sup>	53.7 <sup>15</sup>	30.48 <sup>28</sup>	13.6 <sup>2</sup>	53.62 <sup>24</sup>	34.4 <sup>7</sup>	31.06 <sup>64</sup>	20.8 <sup>19</sup>
δ, Tan δ n Place	2.063 12°.908	+1.804 72''.47	1.274 23°.718	+0.790 31''.60	1.069 47°.760	+0.378 50''.34	3.612 17°.206	+3.471 41''.20
α, D <sub>α</sub> α β, D <sub>β</sub> β	+0.04 -0.2	+0.07 +0.8	+0.02 -0.2	+0.03 +0.8	+0.01 -0.2	+0.02 +0.8	+0.07 -0.2	+0.14 +0.8





FOR THE UPPER TRANSIT AT WASHINGTON.

Solar date.	$\alpha$ Pyxid. Mag. 3.7		$\gamma$ Cancri. Mag. 4.2		$\epsilon$ Hydrae. Mag. 3.5		$\delta$ Argus. Mag. 2.6	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 8 40	° ' — 32 52	h m 8 41	° ' + 29 3	h m 8 42	° ' + 6 43	h m 8 42	° ' — 54 23
	s 12.19	" 38.1	s 35.63	" 74.5	s 18.36	" 53.7	s 23.05	" 37.1
0.6	12.19	38.1	35.63	74.5	18.36	53.7	23.05	37.1
10.6	12.38 <sup>19</sup>	41.4 <sup>33</sup>	35.87 <sup>24</sup>	74.3 <sup>2</sup>	18.58 <sup>22</sup>	52.2 <sup>15</sup>	23.27 <sup>22</sup>	40.9 <sup>38</sup>
20.5	12.53 <sup>15</sup>	44.6 <sup>32</sup>	36.06 <sup>19</sup>	74.4 <sup>1</sup>	18.75 <sup>17</sup>	50.9 <sup>13</sup>	23.41 <sup>14</sup>	44.7 <sup>38</sup>
30.5	12.62 <sup>9</sup>	47.8 <sup>32</sup>	36.20 <sup>14</sup>	74.7 <sup>3</sup>	18.87 <sup>12</sup>	49.8 <sup>11</sup>	23.48 <sup>7</sup>	48.5 <sup>38</sup>
9.5	12.65 <sup>3</sup>	50.8 <sup>30</sup>	36.28 <sup>8</sup>	75.2 <sup>5</sup>	18.93 <sup>6</sup>	48.9 <sup>9</sup>	23.47 <sup>1</sup>	52.1 <sup>36</sup>
	2	27	2	7	2	6	8	35
19.4	12.63 <sup>8</sup>	53.5 <sup>25</sup>	36.30 <sup>3</sup>	75.9 <sup>8</sup>	18.95 <sup>3</sup>	48.3 <sup>5</sup>	23.39 <sup>15</sup>	55.6 <sup>31</sup>
1.4	12.55 <sup>11</sup>	56.0 <sup>21</sup>	36.27 <sup>7</sup>	76.7 <sup>8</sup>	18.92 <sup>6</sup>	47.8 <sup>3</sup>	23.24 <sup>21</sup>	58.7 <sup>28</sup>
11.4	12.44 <sup>15</sup>	58.1 <sup>17</sup>	36.20 <sup>12</sup>	77.5 <sup>8</sup>	18.86 <sup>10</sup>	47.5 <sup>1</sup>	23.03 <sup>25</sup>	61.5 <sup>24</sup>
21.4	12.29 <sup>18</sup>	59.8 <sup>13</sup>	36.08 <sup>14</sup>	78.3 <sup>8</sup>	18.76 <sup>13</sup>	47.4 <sup>1</sup>	22.78 <sup>28</sup>	63.9 <sup>20</sup>
31.3	12.11 <sup>19</sup>	61.1 <sup>9</sup>	35.94 <sup>16</sup>	79.1 <sup>6</sup>	18.63 <sup>14</sup>	47.5 <sup>1</sup>	22.50 <sup>31</sup>	65.9 <sup>14</sup>
10.3	11.92 <sup>19</sup>	62.0 <sup>5</sup>	35.78 <sup>17</sup>	79.7 <sup>6</sup>	18.49 <sup>14</sup>	47.6 <sup>2</sup>	22.19 <sup>33</sup>	67.3 <sup>10</sup>
20.3	11.73 <sup>20</sup>	62.5 <sup>1</sup>	35.61 <sup>16</sup>	80.3 <sup>4</sup>	18.35 <sup>14</sup>	47.8 <sup>3</sup>	21.86 <sup>32</sup>	68.3 <sup>4</sup>
30.3	11.53 <sup>18</sup>	62.6 <sup>3</sup>	35.45 <sup>15</sup>	80.7 <sup>2</sup>	18.21 <sup>13</sup>	48.1 <sup>4</sup>	21.54 <sup>32</sup>	68.7 <sup>6</sup>
10.2	11.35 <sup>17</sup>	62.3 <sup>7</sup>	35.30 <sup>13</sup>	80.9 <sup>1</sup>	18.08 <sup>11</sup>	48.5 <sup>5</sup>	21.22 <sup>30</sup>	68.7 <sup>10</sup>
20.2	11.18 <sup>15</sup>	61.6 <sup>10</sup>	35.17 <sup>11</sup>	81.0 <sup>1</sup>	17.97 <sup>9</sup>	49.0 <sup>4</sup>	20.92 <sup>27</sup>	68.1 <sup>10</sup>
30.2	11.03 <sup>12</sup>	60.6 <sup>14</sup>	35.06 <sup>8</sup>	80.9 <sup>3</sup>	17.88 <sup>7</sup>	49.4 <sup>6</sup>	20.65 <sup>24</sup>	67.1 <sup>15</sup>
9.1	10.91 <sup>9</sup>	59.2 <sup>17</sup>	34.98 <sup>4</sup>	80.6 <sup>4</sup>	17.81 <sup>4</sup>	50.0 <sup>5</sup>	20.41 <sup>20</sup>	65.6 <sup>19</sup>
19.1	10.82 <sup>6</sup>	57.5 <sup>20</sup>	34.94 <sup>1</sup>	80.2 <sup>5</sup>	17.77 <sup>1</sup>	50.5 <sup>5</sup>	20.21 <sup>15</sup>	63.7 <sup>23</sup>
29.1	10.76 <sup>3</sup>	55.5 <sup>22</sup>	34.93 <sup>2</sup>	79.7 <sup>6</sup>	17.76 <sup>2</sup>	51.0 <sup>5</sup>	20.06 <sup>11</sup>	61.4 <sup>25</sup>
9.1	10.73 <sup>1</sup>	53.3 <sup>23</sup>	34.95 <sup>6</sup>	79.1 <sup>8</sup>	17.78 <sup>5</sup>	51.5 <sup>5</sup>	19.95 <sup>6</sup>	58.9 <sup>28</sup>
19.0	10.74 <sup>5</sup>	51.0 <sup>23</sup>	35.01 <sup>9</sup>	78.3 <sup>9</sup>	17.83 <sup>7</sup>	52.0 <sup>5</sup>	19.89 <sup>6</sup>	56.1 <sup>29</sup>
29.0	10.79 <sup>8</sup>	48.7 <sup>23</sup>	35.10 <sup>12</sup>	77.4 <sup>10</sup>	17.90 <sup>11</sup>	52.5 <sup>3</sup>	19.89 <sup>11</sup>	53.2 <sup>29</sup>
8.0	10.87 <sup>12</sup>	46.4 <sup>22</sup>	35.22 <sup>16</sup>	76.4 <sup>10</sup>	18.01 <sup>13</sup>	52.8 <sup>2</sup>	19.95 <sup>18</sup>	50.3 <sup>29</sup>
18.0	10.99 <sup>16</sup>	44.2 <sup>21</sup>	35.38 <sup>19</sup>	75.4 <sup>12</sup>	18.14 <sup>16</sup>	53.0 <sup>1</sup>	20.06 <sup>23</sup>	47.4 <sup>27</sup>
27.9	11.15 <sup>19</sup>	42.1 <sup>17</sup>	35.57 <sup>21</sup>	74.2 <sup>13</sup>	18.30 <sup>19</sup>	53.1 <sup>1</sup>	20.24 <sup>23</sup>	44.7 <sup>24</sup>
6.9	11.34 <sup>22</sup>	40.4 <sup>14</sup>	35.78 <sup>25</sup>	72.9 <sup>13</sup>	18.49 <sup>22</sup>	53.0 <sup>3</sup>	20.47 <sup>28</sup>	42.3 <sup>21</sup>
16.9	11.56 <sup>26</sup>	39.0 <sup>10</sup>	36.03 <sup>27</sup>	71.6 <sup>14</sup>	18.71 <sup>24</sup>	52.7 <sup>6</sup>	20.75 <sup>33</sup>	40.2 <sup>16</sup>
26.8	11.82 <sup>29</sup>	38.0 <sup>5</sup>	36.30 <sup>30</sup>	70.2 <sup>15</sup>	18.95 <sup>26</sup>	52.1 <sup>8</sup>	21.08 <sup>38</sup>	38.6 <sup>10</sup>
6.8	12.11 <sup>32</sup>	37.5 <sup>0</sup>	36.60 <sup>32</sup>	68.7 <sup>15</sup>	19.21 <sup>29</sup>	51.3 <sup>10</sup>	21.46 <sup>41</sup>	37.6 <sup>5</sup>
16.8	12.43 <sup>33</sup>	37.5 <sup>6</sup>	36.92 <sup>34</sup>	67.2 <sup>14</sup>	19.50 <sup>30</sup>	50.3 <sup>13</sup>	21.87 <sup>44</sup>	37.1 <sup>2</sup>
26.8	12.76 <sup>35</sup>	38.1 <sup>11</sup>	37.26 <sup>36</sup>	65.8 <sup>15</sup>	19.80 <sup>32</sup>	49.0 <sup>14</sup>	22.31 <sup>46</sup>	37.3 <sup>8</sup>
5.7	13.11 <sup>35</sup>	39.2 <sup>17</sup>	37.62 <sup>37</sup>	64.3 <sup>14</sup>	20.12 <sup>32</sup>	47.6 <sup>16</sup>	22.77 <sup>46</sup>	38.1 <sup>14</sup>
15.7	13.46 <sup>34</sup>	40.9 <sup>21</sup>	37.99 <sup>36</sup>	62.9 <sup>12</sup>	20.44 <sup>33</sup>	46.0 <sup>17</sup>	23.23 <sup>44</sup>	39.5 <sup>21</sup>
25.7	13.80 <sup>33</sup>	43.0 <sup>26</sup>	38.35 <sup>36</sup>	61.7 <sup>11</sup>	20.77 <sup>32</sup>	44.3 <sup>18</sup>	23.67 <sup>42</sup>	41.6 <sup>26</sup>
5.7	14.13 <sup>31</sup>	45.6 <sup>29</sup>	38.71 <sup>34</sup>	60.6 <sup>9</sup>	21.09 <sup>29</sup>	42.5 <sup>18</sup>	24.09 <sup>38</sup>	44.2 <sup>30</sup>
15.6	14.44 <sup>27</sup>	48.5 <sup>31</sup>	39.05 <sup>31</sup>	59.7 <sup>6</sup>	21.38 <sup>28</sup>	40.7 <sup>17</sup>	24.47 <sup>32</sup>	47.2 <sup>34</sup>
25.6	14.71 <sup>23</sup>	51.6 <sup>32</sup>	39.36 <sup>27</sup>	59.1 <sup>3</sup>	21.66 <sup>24</sup>	39.0 <sup>16</sup>	24.79 <sup>26</sup>	50.6 <sup>37</sup>
35.6	14.94	54.8	39.63	58.8	21.90	37.4	25.05	54.3
1, Tan $\delta$ a Place	1.191 10°.562	−0.646 45''.90	1.144 33°.460	+0.556 77''.68	1.007 16°.581	+0.118 53''.13	1.718 21°.198	−1.397 48''.19
2, D <sub>a</sub> $\alpha$ 3, D <sub>a</sub> $\delta$	−0.01 −0.3	−0.03 +0.8	+0.01 −0.3	+0.02 +0.8	0.00 −0.3	+0.01 +0.8	−0.03 −0.3	−0.06 +0.8



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\sigma^2$ Canceri (mean). Mag. 5.5		$\zeta$ Hydree. Mag. 3.3		$\iota$ Ursæ Majoris. Mag. 3.1		$\alpha$ Canceri. Mag. 4.3	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 8 49 s	° ' " + 30 53 "	h m 8 50 s	° ' " + 6 15 "	h m 8 53 s	° ' " + 48 22 "	h m 8 53 s	° ' " + 12 "
Jan. 0.6	5.94	63.6	55.91	71.3	26.54	27.6	52.24	73.6
10.6	6.20 <sup>26</sup>	63.5 <sup>1</sup>	56.13 <sup>22</sup>	69.8 <sup>15</sup>	26.85 <sup>31</sup>	28.4 <sup>8</sup>	52.47 <sup>23</sup>	72.4
20.5	6.40 <sup>20</sup>	63.6 <sup>1</sup>	56.31 <sup>18</sup>	68.4 <sup>14</sup>	27.10 <sup>25</sup>	29.5 <sup>11</sup>	52.66 <sup>19</sup>	71.4
30.5	6.55 <sup>15</sup>	64.0 <sup>4</sup>	56.43 <sup>12</sup>	67.3 <sup>11</sup>	27.28 <sup>18</sup>	30.9 <sup>14</sup>	52.79 <sup>13</sup>	70.6
Feb. 9.5	6.64 <sup>9</sup>	64.6 <sup>6</sup>	56.51 <sup>8</sup>	66.3 <sup>10</sup>	27.39 <sup>11</sup>	32.5 <sup>16</sup>	52.87 <sup>8</sup>	70.0
	3	8	2	7	3	17	3	
19.5	6.67	65.4	56.53	65.6	27.42	34.2	52.90	69.7
Mar. 1.4	6.64 <sup>3</sup>	66.3 <sup>9</sup>	56.51 <sup>2</sup>	65.1 <sup>5</sup>	27.38 <sup>4</sup>	36.0 <sup>18</sup>	52.89 <sup>1</sup>	69.5
11.4	6.57 <sup>7</sup>	67.2 <sup>9</sup>	56.45 <sup>6</sup>	64.8 <sup>3</sup>	27.28 <sup>10</sup>	37.7 <sup>17</sup>	52.83 <sup>6</sup>	69.5
21.4	6.46 <sup>11</sup>	68.1 <sup>9</sup>	56.36 <sup>9</sup>	64.7 <sup>1</sup>	27.13 <sup>15</sup>	39.2 <sup>15</sup>	52.74 <sup>9</sup>	69.7
31.3	6.32 <sup>14</sup>	68.9 <sup>8</sup>	56.24 <sup>12</sup>	64.7 <sup>0</sup>	26.93 <sup>20</sup>	40.6 <sup>14</sup>	52.62 <sup>12</sup>	69.9
	16	8	13	2	22	11	14	
Apr. 10.3	6.16	69.7	56.11	64.9	26.71	41.7	52.48	70.2
20.3	5.99 <sup>17</sup>	70.3 <sup>6</sup>	55.97 <sup>14</sup>	65.1 <sup>2</sup>	26.48 <sup>23</sup>	42.5 <sup>8</sup>	52.34 <sup>14</sup>	70.5
30.3	5.83 <sup>16</sup>	70.8 <sup>5</sup>	55.83 <sup>14</sup>	65.4 <sup>3</sup>	26.25 <sup>23</sup>	42.9 <sup>4</sup>	52.20 <sup>14</sup>	70.9
May 10.2	5.67 <sup>16</sup>	71.0 <sup>2</sup>	55.70 <sup>13</sup>	65.8 <sup>4</sup>	26.03 <sup>22</sup>	43.1 <sup>2</sup>	52.07 <sup>13</sup>	71.3
20.2	5.54 <sup>13</sup>	71.1 <sup>1</sup>	55.58 <sup>12</sup>	66.2 <sup>4</sup>	25.82 <sup>21</sup>	42.9 <sup>2</sup>	51.96 <sup>11</sup>	71.7
	12	1	9	5	17	6	10	
30.2	5.42	71.0	55.49	66.7	25.65	42.3	51.86	72.0
June 9.2	5.34 <sup>8</sup>	70.7 <sup>3</sup>	55.42 <sup>7</sup>	67.3 <sup>6</sup>	25.51 <sup>14</sup>	41.4 <sup>9</sup>	51.79 <sup>7</sup>	72.4
19.1	5.28 <sup>6</sup>	70.3 <sup>4</sup>	55.37 <sup>5</sup>	67.8 <sup>5</sup>	25.42 <sup>9</sup>	40.3 <sup>11</sup>	51.74 <sup>5</sup>	72.7
29.1	5.26 <sup>2</sup>	69.7 <sup>6</sup>	55.36 <sup>1</sup>	68.3 <sup>5</sup>	25.37 <sup>5</sup>	38.9 <sup>14</sup>	51.73 <sup>1</sup>	73.0
July 9.1	5.28 <sup>2</sup>	68.9 <sup>8</sup>	55.37 <sup>1</sup>	68.9 <sup>6</sup>	25.36 <sup>1</sup>	37.2 <sup>17</sup>	51.74 <sup>1</sup>	73.2
	5	9	4	5	4	18	4	
19.0	5.33 <sup>8</sup>	68.0 <sup>10</sup>	55.41 <sup>7</sup>	69.4 <sup>4</sup>	25.40 <sup>8</sup>	35.4 <sup>20</sup>	51.78 <sup>7</sup>	73.4
29.0	5.41 <sup>12</sup>	67.0 <sup>11</sup>	55.48 <sup>10</sup>	69.8 <sup>4</sup>	25.48 <sup>13</sup>	33.4 <sup>20</sup>	51.85 <sup>10</sup>	73.5
Aug. 8.0	5.53 <sup>15</sup>	65.9 <sup>12</sup>	55.58 <sup>12</sup>	70.2 <sup>2</sup>	25.61 <sup>17</sup>	31.4 <sup>22</sup>	51.95 <sup>13</sup>	73.5
18.0	5.68 <sup>18</sup>	64.7 <sup>13</sup>	55.70 <sup>16</sup>	70.4 <sup>0</sup>	25.78 <sup>22</sup>	29.2 <sup>22</sup>	52.08 <sup>15</sup>	73.3
27.9	5.86 <sup>22</sup>	63.4 <sup>14</sup>	55.86 <sup>18</sup>	70.4 <sup>1</sup>	26.00 <sup>26</sup>	27.0 <sup>22</sup>	52.23 <sup>18</sup>	73.1
								5
Sept. 6.9	6.08	62.0	56.04	70.3	26.26	24.8	52.41	72.6
16.9	6.32 <sup>24</sup>	60.6 <sup>14</sup>	56.24 <sup>20</sup>	70.0 <sup>3</sup>	26.55 <sup>29</sup>	22.6 <sup>22</sup>	52.62 <sup>21</sup>	72.0
26.9	6.59 <sup>27</sup>	59.1 <sup>15</sup>	56.48 <sup>24</sup>	69.5 <sup>5</sup>	26.88 <sup>33</sup>	20.4 <sup>22</sup>	52.86 <sup>24</sup>	71.2
Oct. 6.8	6.89 <sup>30</sup>	57.5 <sup>16</sup>	56.74 <sup>26</sup>	68.7 <sup>8</sup>	27.25 <sup>37</sup>	18.4 <sup>20</sup>	53.12 <sup>26</sup>	70.2
16.8	7.21 <sup>32</sup>	55.9 <sup>16</sup>	57.02 <sup>28</sup>	67.7 <sup>10</sup>	27.65 <sup>40</sup>	16.5 <sup>19</sup>	53.41 <sup>29</sup>	69.0
	35	15	30	13	42	17	30	14
26.8	7.56	54.4	57.32	66.4	28.07	14.8	53.71	67.6
Nov. 5.7	7.92 <sup>36</sup>	52.9 <sup>15</sup>	57.63 <sup>31</sup>	64.9 <sup>15</sup>	28.51 <sup>44</sup>	13.3 <sup>15</sup>	54.04 <sup>33</sup>	66.1
15.7	8.29 <sup>37</sup>	51.4 <sup>15</sup>	57.96 <sup>33</sup>	63.3 <sup>16</sup>	28.97 <sup>46</sup>	12.1 <sup>12</sup>	54.37 <sup>33</sup>	64.5
25.7	8.66 <sup>37</sup>	50.2 <sup>12</sup>	58.29 <sup>33</sup>	61.5 <sup>18</sup>	29.43 <sup>46</sup>	11.2 <sup>9</sup>	54.70 <sup>33</sup>	62.8
Dec. 5.7	9.03 <sup>37</sup>	49.1 <sup>11</sup>	58.61 <sup>32</sup>	59.7 <sup>18</sup>	29.88 <sup>45</sup>	10.6 <sup>6</sup>	55.03 <sup>33</sup>	61.2
	35	8	30	18	43	2	31	16
15.6	9.38	48.3	58.91	57.9	30.31	10.4	55.34	59.6
25.6	9.70 <sup>32</sup>	47.7 <sup>6</sup>	59.19 <sup>28</sup>	56.2 <sup>17</sup>	30.70 <sup>39</sup>	10.6 <sup>2</sup>	55.63 <sup>29</sup>	58.1
35.6	9.98 <sup>28</sup>	47.4 <sup>3</sup>	59.43 <sup>24</sup>	54.5 <sup>17</sup>	31.05 <sup>35</sup>	11.2 <sup>6</sup>	55.88 <sup>25</sup>	56.7
Sec $\delta$ , Tan $\delta$	1.165	+0.598	1.006	+0.110	1.505	+1.125	1.023	+0.316
Mean Place	3 <sup>h</sup> .755	67 <sup>m</sup> .52	54 <sup>h</sup> .154	71 <sup>m</sup> .00	23 <sup>h</sup> .714	34 <sup>m</sup> .26	50 <sup>h</sup> .424	74 <sup>m</sup> .60
D' $\psi$ a, D <sub>a</sub> a	+0.01	+0.03	0.00	0.00	+0.02	+0.05	0.00	+0.01
D $\psi$ $\delta$ , D <sub>a</sub> $\delta$	-0.3	+0.7	-0.3	+0.7	-0.3	+0.7	-0.3	+0.7

FOR THE UPPER TRANSIT AT



FOR THE UPPER TRANSIT AT WASHINGTON.

ζ Argus. Mag. 2.2		40 Lynceis. Mag. 3.3		θ Pyxidis. Mag. 4.9		α Hydræ. Mag. 2.2	
Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
h m 9 14 s	° ' — 58 54 "	h m 9 15 s	° ' + 34 44 "	h m 9 17 s	° ' — 25 36 "	h m 9 23 s	° ' — 8 17 "
50.50	52.9	55.07	63.1	45.03	6.4	26.16	20.0
50.78 <sup>28</sup>	56.6 <sup>37</sup>	55.36 <sup>29</sup>	63.0 <sup>1</sup>	45.27 <sup>24</sup>	9.4 <sup>30</sup>	26.40 <sup>24</sup>	22.3 <sup>23</sup>
50.99 <sup>21</sup>	60.4 <sup>38</sup>	55.60 <sup>24</sup>	63.3 <sup>3</sup>	45.46 <sup>19</sup>	12.4 <sup>30</sup>	26.60 <sup>20</sup>	24.6 <sup>23</sup>
51.12 <sup>13</sup>	64.3 <sup>39</sup>	55.78 <sup>18</sup>	63.8 <sup>5</sup>	45.59 <sup>13</sup>	15.3 <sup>29</sup>	26.75 <sup>15</sup>	26.6 <sup>20</sup>
51.16 <sup>4</sup>	68.1 <sup>38</sup>	55.90 <sup>12</sup>	64.6 <sup>8</sup>	45.68 <sup>9</sup>	18.1 <sup>28</sup>	26.85 <sup>10</sup>	28.5 <sup>19</sup>
3	37	6	9	3	26	5	16
51.13	71.8	55.96	65.5	45.71	20.7	26.90	30.1
51.01 <sup>12</sup>	75.3 <sup>35</sup>	55.96 <sup>0</sup>	66.7 <sup>12</sup>	45.69 <sup>2</sup>	23.0 <sup>23</sup>	26.90 <sup>0</sup>	31.5 <sup>14</sup>
50.83 <sup>18</sup>	78.5 <sup>32</sup>	55.91 <sup>5</sup>	67.9 <sup>12</sup>	45.63 <sup>6</sup>	25.0 <sup>20</sup>	26.86 <sup>4</sup>	32.7 <sup>12</sup>
50.59 <sup>24</sup>	81.3 <sup>28</sup>	55.82 <sup>9</sup>	69.1 <sup>12</sup>	45.53 <sup>10</sup>	26.6 <sup>16</sup>	26.79 <sup>7</sup>	33.5 <sup>8</sup>
50.30 <sup>29</sup>	83.7 <sup>24</sup>	55.69 <sup>13</sup>	70.2 <sup>11</sup>	45.41 <sup>12</sup>	27.9 <sup>13</sup>	26.69 <sup>10</sup>	34.1 <sup>6</sup>
32	19	15	10	15	10	12	4
49.98	85.6	55.54	71.2	45.26	28.9	26.57	34.5
49.63 <sup>35</sup>	87.1 <sup>15</sup>	55.37 <sup>17</sup>	72.0 <sup>8</sup>	45.10 <sup>16</sup>	29.6 <sup>7</sup>	26.44 <sup>13</sup>	34.7 <sup>2</sup>
49.28 <sup>35</sup>	88.1 <sup>10</sup>	55.20 <sup>17</sup>	72.7 <sup>7</sup>	44.94 <sup>16</sup>	29.8 <sup>2</sup>	26.30 <sup>14</sup>	34.6 <sup>1</sup>
48.92 <sup>36</sup>	88.5 <sup>4</sup>	55.03 <sup>17</sup>	73.1 <sup>4</sup>	44.78 <sup>16</sup>	29.8 <sup>0</sup>	26.17 <sup>13</sup>	34.3 <sup>3</sup>
48.57 <sup>35</sup>	88.4 <sup>1</sup>	54.88 <sup>15</sup>	73.3 <sup>2</sup>	44.63 <sup>15</sup>	29.3 <sup>5</sup>	26.05 <sup>12</sup>	33.9 <sup>4</sup>
33	6	14	1	14	7	11	6
48.24	87.8	54.74	73.2	44.49	28.6	25.94	33.3
47.94 <sup>30</sup>	86.7 <sup>11</sup>	54.63 <sup>11</sup>	73.0 <sup>2</sup>	44.38 <sup>11</sup>	27.6 <sup>10</sup>	25.85 <sup>9</sup>	32.5 <sup>8</sup>
47.67 <sup>27</sup>	85.2 <sup>15</sup>	54.55 <sup>8</sup>	72.5 <sup>5</sup>	44.29 <sup>9</sup>	26.3 <sup>13</sup>	25.78 <sup>7</sup>	31.5 <sup>10</sup>
47.44 <sup>23</sup>	83.2 <sup>20</sup>	54.51 <sup>4</sup>	71.8 <sup>7</sup>	44.22 <sup>7</sup>	24.7 <sup>16</sup>	25.73 <sup>5</sup>	30.5 <sup>10</sup>
47.26 <sup>18</sup>	80.9 <sup>23</sup>	54.49 <sup>2</sup>	70.9 <sup>9</sup>	44.18 <sup>4</sup>	23.0 <sup>17</sup>	25.71 <sup>2</sup>	29.4 <sup>11</sup>
12	26	2	11	1	19	0	11
47.14	78.3	54.51	69.8	44.17	21.1	25.71	28.3
47.07 <sup>7</sup>	75.5 <sup>28</sup>	54.56 <sup>5</sup>	68.6 <sup>12</sup>	44.18 <sup>1</sup>	19.2 <sup>19</sup>	25.74 <sup>3</sup>	27.1 <sup>12</sup>
47.06 <sup>1</sup>	72.6 <sup>29</sup>	54.65 <sup>9</sup>	67.2 <sup>14</sup>	44.23 <sup>5</sup>	17.3 <sup>19</sup>	25.80 <sup>6</sup>	26.0 <sup>11</sup>
47.12 <sup>6</sup>	69.7 <sup>29</sup>	54.78 <sup>13</sup>	65.7 <sup>15</sup>	44.32 <sup>9</sup>	15.4 <sup>19</sup>	25.89 <sup>9</sup>	25.0 <sup>10</sup>
47.25 <sup>13</sup>	66.8 <sup>29</sup>	54.93 <sup>15</sup>	64.1 <sup>16</sup>	44.44 <sup>12</sup>	13.7 <sup>17</sup>	26.01 <sup>12</sup>	24.2 <sup>8</sup>
20	27	19	17	15	15	14	6
47.45	64.1	55.12	62.4	44.59	12.2	26.15	23.6
47.71 <sup>26</sup>	61.8 <sup>23</sup>	55.34 <sup>22</sup>	60.6 <sup>18</sup>	44.77 <sup>18</sup>	10.9 <sup>13</sup>	26.33 <sup>18</sup>	23.2 <sup>4</sup>
48.04 <sup>33</sup>	59.8 <sup>20</sup>	55.60 <sup>26</sup>	58.7 <sup>19</sup>	44.99 <sup>22</sup>	10.1 <sup>8</sup>	26.53 <sup>20</sup>	23.1 <sup>1</sup>
48.42 <sup>38</sup>	58.4 <sup>14</sup>	55.88 <sup>28</sup>	56.9 <sup>18</sup>	45.24 <sup>25</sup>	9.7 <sup>4</sup>	26.77 <sup>24</sup>	23.4 <sup>3</sup>
48.86 <sup>44</sup>	57.5 <sup>9</sup>	56.20 <sup>32</sup>	55.0 <sup>19</sup>	45.52 <sup>28</sup>	9.7 <sup>0</sup>	27.03 <sup>26</sup>	24.0 <sup>6</sup>
47	3	34	19	31	5	29	10
49.33	57.2	56.54	53.1	45.83	10.2	27.32	25.0
49.83 <sup>50</sup>	57.5 <sup>3</sup>	56.91 <sup>37</sup>	51.4 <sup>17</sup>	46.16 <sup>33</sup>	11.3 <sup>11</sup>	27.63 <sup>31</sup>	26.3 <sup>13</sup>
50.34 <sup>51</sup>	58.5 <sup>10</sup>	57.29 <sup>38</sup>	49.8 <sup>16</sup>	46.50 <sup>34</sup>	12.7 <sup>14</sup>	27.95 <sup>32</sup>	27.9 <sup>16</sup>
50.85 <sup>51</sup>	60.2 <sup>17</sup>	57.68 <sup>39</sup>	48.3 <sup>15</sup>	46.84 <sup>34</sup>	14.7 <sup>20</sup>	28.28 <sup>33</sup>	29.8 <sup>19</sup>
51.33 <sup>48</sup>	62.4 <sup>22</sup>	58.06 <sup>38</sup>	47.1 <sup>12</sup>	47.18 <sup>34</sup>	17.0 <sup>23</sup>	28.60 <sup>32</sup>	32.0 <sup>22</sup>
45	28	37	9	32	26	32	22
51.78	65.2	58.43	46.2	47.50	19.6	28.92	34.2
52.18 <sup>40</sup>	68.4 <sup>32</sup>	58.78 <sup>35</sup>	45.6 <sup>6</sup>	47.80 <sup>30</sup>	22.4 <sup>28</sup>	29.21 <sup>29</sup>	36.6 <sup>24</sup>
52.52 <sup>34</sup>	71.9 <sup>35</sup>	59.10 <sup>32</sup>	45.3 <sup>3</sup>	48.06 <sup>26</sup>	25.4 <sup>30</sup>	29.47 <sup>26</sup>	39.0 <sup>24</sup>
1.937    —1.659		1.217    +0.694		1.109    —0.479		1.011    —0.146	
48°.782    65''.45		52°.878    69''.62		43°.581    12''.89		24°.653    22''.41	
—0.03    —0.08		+0.01    +0.03		—0.01    —0.02		0.00    —0.01	
—0.3    +0.7		—0.3    +0.7		—0.3    +0.7		—0.3    +0.6	

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	h Ursæ Majoris. Mag. 3.8		d Ursæ Majoris. Mag. 4.6		θ Ursæ Majoris. Mag. 3.3		φ Argus. Mag. 3.6	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 9 24 s	° ' " + 63 25 "	h m 9 26 s	° ' " + 70 11 "	h m 9 27 s	° ' " + 52 3 "	h m 9 27 s	° ' " - 40 5 "
Jan. 0.6	54.53	52.4	64.45	65.6	13.72	45.6	22.38	30.5
10.6	55.01 <sup>48</sup>	53.7 <sup>13</sup>	65.05 <sup>60</sup>	67.1 <sup>15</sup>	14.09 <sup>37</sup>	46.3 <sup>7</sup>	22.64 <sup>26</sup>	33.9 <sup>34</sup>
20.6	55.40 <sup>39</sup>	55.4 <sup>17</sup>	65.54 <sup>49</sup>	69.1 <sup>20</sup>	14.40 <sup>31</sup>	47.4 <sup>11</sup>	22.84 <sup>20</sup>	37.3 <sup>34</sup>
30.5	55.69 <sup>29</sup>	57.4 <sup>20</sup>	65.90 <sup>36</sup>	71.4 <sup>23</sup>	14.64 <sup>24</sup>	48.8 <sup>14</sup>	22.99 <sup>15</sup>	40.8 <sup>35</sup>
Feb. 9.5	55.88 <sup>19</sup>	59.7 <sup>23</sup>	66.13 <sup>23</sup>	73.9 <sup>25</sup>	14.79 <sup>15</sup>	50.5 <sup>17</sup>	23.07 <sup>8</sup>	44.2 <sup>34</sup>
	9	24	9	26	8	19	3	32
19.5	55.97	62.1	66.22	76.5	14.87	52.4	23.10	47.4
Mar. 1.5	55.95 <sup>2</sup>	64.5 <sup>24</sup>	66.18 <sup>4</sup>	79.2 <sup>27</sup>	14.87 <sup>0</sup>	54.4 <sup>20</sup>	23.07 <sup>3</sup>	50.4 <sup>30</sup>
11.4	55.84 <sup>11</sup>	66.9 <sup>24</sup>	66.02 <sup>16</sup>	81.8 <sup>26</sup>	14.81 <sup>6</sup>	56.4 <sup>20</sup>	22.99 <sup>8</sup>	53.0 <sup>26</sup>
21.4	55.64 <sup>20</sup>	69.1 <sup>22</sup>	65.74 <sup>28</sup>	84.2 <sup>24</sup>	14.68 <sup>13</sup>	58.3 <sup>19</sup>	22.87 <sup>12</sup>	55.4 <sup>24</sup>
31.4	55.37 <sup>27</sup>	71.1 <sup>20</sup>	65.37 <sup>37</sup>	86.3 <sup>21</sup>	14.50 <sup>18</sup>	60.0 <sup>17</sup>	22.71 <sup>16</sup>	57.3 <sup>19</sup>
	32	16	45	16	22	14	18	15
Apr. 10.3	55.05	72.7	64.92	87.9	14.28	61.4	22.53	58.8
20.3	54.69 <sup>36</sup>	73.9 <sup>12</sup>	64.43 <sup>49</sup>	89.2 <sup>13</sup>	14.04 <sup>24</sup>	62.6 <sup>12</sup>	22.34 <sup>19</sup>	59.9 <sup>11</sup>
30.3	54.32 <sup>37</sup>	74.6 <sup>7</sup>	63.92 <sup>51</sup>	90.0 <sup>8</sup>	13.79 <sup>25</sup>	63.4 <sup>8</sup>	22.13 <sup>21</sup>	60.6 <sup>7</sup>
May 10.3	53.95 <sup>37</sup>	74.9 <sup>3</sup>	63.40 <sup>52</sup>	90.2 <sup>2</sup>	13.54 <sup>25</sup>	63.8 <sup>4</sup>	21.93 <sup>20</sup>	60.9 <sup>3</sup>
20.2	53.59 <sup>36</sup>	74.8 <sup>1</sup>	62.90 <sup>50</sup>	89.9 <sup>3</sup>	13.30 <sup>24</sup>	63.8 <sup>0</sup>	21.73 <sup>20</sup>	60.7 <sup>2</sup>
	33	6	46	7	22	3	19	6
30.2	53.26	74.2	62.44	89.2	13.08	63.5	21.54	60.1
June 9.2	52.98 <sup>28</sup>	73.1 <sup>11</sup>	62.03 <sup>41</sup>	87.9 <sup>13</sup>	12.90 <sup>18</sup>	62.7 <sup>8</sup>	21.38 <sup>16</sup>	59.0 <sup>11</sup>
19.2	52.75 <sup>23</sup>	71.6 <sup>15</sup>	61.68 <sup>35</sup>	86.3 <sup>16</sup>	12.75 <sup>15</sup>	61.7 <sup>10</sup>	21.24 <sup>14</sup>	57.6 <sup>14</sup>
29.1	52.57 <sup>18</sup>	69.8 <sup>18</sup>	61.41 <sup>27</sup>	84.2 <sup>21</sup>	12.64 <sup>11</sup>	60.3 <sup>14</sup>	21.12 <sup>12</sup>	55.9 <sup>17</sup>
July 9.1	52.46 <sup>11</sup>	67.6 <sup>22</sup>	61.22 <sup>19</sup>	81.8 <sup>24</sup>	12.57 <sup>7</sup>	58.6 <sup>17</sup>	21.03 <sup>9</sup>	53.9 <sup>20</sup>
	4	24	10	27	1	19	5	22
19.1	52.42	65.2	61.12	79.1	12.56	56.7	20.98	51.7
29.0	52.44 <sup>2</sup>	62.5 <sup>27</sup>	61.11 <sup>1</sup>	76.2 <sup>29</sup>	12.59 <sup>3</sup>	54.5 <sup>22</sup>	20.97 <sup>1</sup>	49.3 <sup>24</sup>
Aug. 8.0	52.52 <sup>8</sup>	59.7 <sup>28</sup>	61.19 <sup>8</sup>	73.1 <sup>31</sup>	12.67 <sup>8</sup>	52.2 <sup>23</sup>	20.99 <sup>2</sup>	46.8 <sup>25</sup>
18.0	52.68 <sup>16</sup>	56.8 <sup>29</sup>	61.37 <sup>18</sup>	70.0 <sup>31</sup>	12.79 <sup>12</sup>	49.7 <sup>25</sup>	21.05 <sup>6</sup>	44.4 <sup>24</sup>
28.0	52.90 <sup>22</sup>	53.8 <sup>30</sup>	61.63 <sup>26</sup>	66.8 <sup>32</sup>	12.96 <sup>17</sup>	47.2 <sup>25</sup>	21.16 <sup>11</sup>	42.1 <sup>23</sup>
	29	29	35	32	22	26	14	22
Sept. 6.9	53.19	50.9	61.98	63.6	13.18	44.6	21.30	39.9
16.9	53.54 <sup>35</sup>	47.9 <sup>30</sup>	62.42 <sup>44</sup>	60.5 <sup>31</sup>	13.44 <sup>26</sup>	42.0 <sup>26</sup>	21.49 <sup>19</sup>	38.1 <sup>18</sup>
26.9	53.95 <sup>41</sup>	45.1 <sup>28</sup>	62.93 <sup>51</sup>	57.5 <sup>30</sup>	13.75 <sup>31</sup>	39.5 <sup>25</sup>	21.73 <sup>24</sup>	36.6 <sup>15</sup>
Oct. 6.9	54.41 <sup>46</sup>	42.5 <sup>26</sup>	63.53 <sup>60</sup>	54.7 <sup>28</sup>	14.10 <sup>35</sup>	37.0 <sup>25</sup>	22.00 <sup>27</sup>	35.6 <sup>10</sup>
16.8	54.93 <sup>52</sup>	40.1 <sup>24</sup>	64.19 <sup>66</sup>	52.2 <sup>25</sup>	14.49 <sup>39</sup>	34.7 <sup>23</sup>	22.31 <sup>31</sup>	35.1 <sup>5</sup>
	56	22	71	21	42	22	34	1
26.8	55.49	37.9	64.90	50.1	14.91	32.5	22.65	35.2
Nov. 5.8	56.09 <sup>60</sup>	36.1 <sup>18</sup>	65.67 <sup>77</sup>	48.3 <sup>18</sup>	15.36 <sup>45</sup>	30.6 <sup>19</sup>	23.02 <sup>37</sup>	35.8 <sup>6</sup>
15.7	56.72 <sup>63</sup>	34.7 <sup>14</sup>	66.47 <sup>80</sup>	46.9 <sup>14</sup>	15.84 <sup>48</sup>	29.1 <sup>15</sup>	23.40 <sup>38</sup>	37.0 <sup>12</sup>
25.7	57.36 <sup>64</sup>	33.7 <sup>10</sup>	67.28 <sup>81</sup>	46.1 <sup>8</sup>	16.33 <sup>49</sup>	27.8 <sup>13</sup>	23.78 <sup>38</sup>	37.0 <sup>18</sup>
Dec. 5.7	57.99 <sup>63</sup>	33.2 <sup>5</sup>	68.08 <sup>80</sup>	45.7 <sup>4</sup>	16.81 <sup>48</sup>	26.9 <sup>9</sup>	24.16 <sup>38</sup>	38.8 <sup>22</sup>
	62	0	77	2	47	4	36	27
15.7	58.61	33.2	68.85	45.9	17.28	26.5	24.52	43.7
25.6	59.18 <sup>57</sup>	33.7 <sup>5</sup>	69.58 <sup>73</sup>	46.6 <sup>7</sup>	17.72 <sup>44</sup>	26.5 <sup>0</sup>	24.85 <sup>33</sup>	46.8 <sup>31</sup>
35.6	59.69 <sup>51</sup>	34.7 <sup>10</sup>	70.22 <sup>64</sup>	47.9 <sup>13</sup>	18.12 <sup>40</sup>	26.9 <sup>4</sup>	25.13 <sup>28</sup>	50.0 <sup>32</sup>
Sec δ, Tan δ	2.235	+2.000	2.953	+2.778	1.627	+1.283	1.307	-0.842
Mean Place	50°.659	63'' .55	59°.460	77'' .40	10°.855	55'' .70	20°.963	40'' .03
D'ψ a, Dω a	+0.03	+0.10	+0.05	+0.15	+0.02	+0.07	-0.01	-0.04
Dψ δ, Dω δ	-0.3	+0.6	-0.3	+0.6	-0.3	+0.6	-0.3	+0.6

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ξ Leonis. Mag. 5.1		10 Leonis Minoris. Mag. 4.6		ζ Chamæleontis. Mag. 5.2		ο Leonis. Mag. 3.8	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 9 27 s 23.66	° ' + 11 40 " 34.1	h m 9 29 s 3.48	° ' + 36 46 " 24.4	h m 9 36 s 28.84	° ' − 80 33 " 19.0	h m 9 36 s 38.59	° ' + 10 16 " 44.2
Jan. 0.6	23.66	34.1	3.48	24.4	28.84	19.0	38.59	44.2
10.6	23.92 <sup>26</sup>	32.7 <sup>14</sup>	3.78 <sup>30</sup>	24.4 <sup>0</sup>	29.60 <sup>76</sup>	22.4 <sup>34</sup>	38.85 <sup>26</sup>	42.8 <sup>14</sup>
20.6	24.13 <sup>21</sup>	31.5 <sup>12</sup>	4.04 <sup>26</sup>	24.7 <sup>3</sup>	30.13 <sup>53</sup>	26.1 <sup>37</sup>	39.07 <sup>22</sup>	41.5 <sup>13</sup>
30.5	24.30 <sup>17</sup>	30.6 <sup>9</sup>	4.24 <sup>20</sup>	25.3 <sup>6</sup>	30.42 <sup>29</sup>	30.0 <sup>39</sup>	39.25 <sup>18</sup>	40.5 <sup>10</sup>
Feb. 9.5	24.42 <sup>12</sup> 6	30.0 <sup>6</sup> 5	4.38 <sup>14</sup> 8	26.1 <sup>8</sup> 11	30.48 <sup>6</sup> 18	34.0 <sup>40</sup> 39	39.37 <sup>12</sup> 8	39.7 <sup>8</sup> 6
19.5	24.48	29.5	4.46	27.2	30.30	37.9	39.45	39.1
Mar. 1.5	24.50 <sup>2</sup>	29.3 <sup>2</sup>	4.48 <sup>2</sup>	28.5 <sup>13</sup>	29.90 <sup>40</sup>	41.7 <sup>38</sup>	39.47 <sup>2</sup>	38.8 <sup>3</sup>
11.4	24.47 <sup>3</sup>	29.3 <sup>0</sup>	4.44 <sup>4</sup>	29.8 <sup>13</sup>	29.30 <sup>60</sup>	45.4 <sup>37</sup>	39.45 <sup>2</sup>	38.7 <sup>1</sup>
21.4	24.40 <sup>7</sup>	29.4 <sup>1</sup>	4.35 <sup>9</sup>	31.1 <sup>13</sup>	28.51 <sup>79</sup>	48.7 <sup>33</sup>	39.39 <sup>6</sup>	38.8 <sup>1</sup>
31.4	24.31 <sup>9</sup> 12	29.7 <sup>3</sup> 3	4.23 <sup>12</sup> 15	32.4 <sup>13</sup> 11	27.57 <sup>94</sup> 107	51.7 <sup>30</sup> 26	39.31 <sup>8</sup> 11	39.0 <sup>2</sup> 3
Apr. 10.3	24.19	30.0	4.08	33.5	26.50	54.3	39.20	39.3
20.3	24.06 <sup>13</sup>	30.4 <sup>4</sup>	3.91 <sup>17</sup>	34.5 <sup>10</sup>	25.32 <sup>118</sup>	56.4 <sup>21</sup>	39.07 <sup>13</sup>	39.7 <sup>4</sup>
30.3	23.93 <sup>13</sup>	30.9 <sup>5</sup>	3.74 <sup>17</sup>	35.2 <sup>7</sup>	24.08 <sup>124</sup>	58.1 <sup>17</sup>	38.95 <sup>12</sup>	40.1 <sup>4</sup>
May 10.3	23.80 <sup>13</sup>	31.3 <sup>4</sup>	3.57 <sup>17</sup>	35.7 <sup>5</sup>	22.79 <sup>129</sup>	59.3 <sup>12</sup>	38.82 <sup>13</sup>	40.6 <sup>5</sup>
20.2	23.68 <sup>12</sup> 10	31.7 <sup>4</sup> 5	3.41 <sup>16</sup> 15	36.0 <sup>3</sup> 0	21.49 <sup>130</sup> 128	59.9 <sup>6</sup> 0	38.70 <sup>12</sup> 11	41.0 <sup>4</sup> 5
30.2	23.58	32.2	3.26	36.0	20.21	59.9	38.59	41.5
June 9.2	23.49 <sup>9</sup>	32.6 <sup>4</sup>	3.14 <sup>12</sup>	35.8 <sup>2</sup>	18.98 <sup>123</sup>	59.4 <sup>5</sup>	38.50 <sup>9</sup>	41.9 <sup>4</sup>
19.2	23.43 <sup>6</sup>	32.9 <sup>3</sup>	3.05 <sup>9</sup>	35.3 <sup>5</sup>	17.83 <sup>115</sup>	58.4 <sup>10</sup>	38.43 <sup>7</sup>	42.3 <sup>4</sup>
29.1	23.39 <sup>4</sup>	33.2 <sup>3</sup>	2.99 <sup>6</sup>	34.5 <sup>8</sup>	16.78 <sup>105</sup>	56.9 <sup>15</sup>	38.39 <sup>4</sup>	42.7 <sup>4</sup>
July 9.1	23.37 <sup>2</sup> 1	33.4 <sup>2</sup> 2	2.96 <sup>3</sup> 0	33.5 <sup>10</sup> 11	15.87 <sup>91</sup> 74	55.0 <sup>19</sup> 24	38.37 <sup>2</sup> 0	42.9 <sup>2</sup> 3
19.1	23.38	33.6	2.96	32.4	15.13	52.6	38.37	43.2
29.0	23.42 <sup>4</sup>	33.7 <sup>1</sup>	3.00 <sup>4</sup>	31.1 <sup>13</sup>	14.58 <sup>55</sup>	50.0 <sup>26</sup>	38.40 <sup>3</sup>	43.3 <sup>1</sup>
Aug. 8.0	23.49 <sup>7</sup>	33.6 <sup>1</sup>	3.07 <sup>7</sup>	29.6 <sup>15</sup>	14.23 <sup>35</sup>	47.1 <sup>29</sup>	38.45 <sup>5</sup>	43.3 <sup>0</sup>
18.0	23.58 <sup>9</sup>	33.4 <sup>2</sup>	3.18 <sup>11</sup>	27.9 <sup>17</sup>	14.10 <sup>13</sup>	44.1 <sup>30</sup>	38.54 <sup>9</sup>	43.2 <sup>1</sup>
28.0	23.70 <sup>12</sup> 15	33.1 <sup>3</sup> 5	3.32 <sup>14</sup> 18	26.1 <sup>18</sup> 18	14.20 <sup>10</sup> 34	41.1 <sup>30</sup> 30	38.65 <sup>11</sup> 14	43.0 <sup>2</sup> 5
Sept. 6.9	23.85	32.6	3.50	24.3	14.54	38.1	38.79	42.5
16.9	24.03 <sup>18</sup>	31.9 <sup>7</sup>	3.71 <sup>21</sup>	22.3 <sup>20</sup>	15.11 <sup>57</sup>	35.3 <sup>28</sup>	38.96 <sup>17</sup>	41.9 <sup>6</sup>
26.9	24.24 <sup>21</sup>	31.0 <sup>9</sup>	3.96 <sup>25</sup>	20.3 <sup>20</sup>	15.89 <sup>78</sup>	32.9 <sup>24</sup>	39.16 <sup>20</sup>	41.0 <sup>9</sup>
Oct. 6.9	24.48 <sup>24</sup>	29.9 <sup>11</sup>	4.24 <sup>28</sup>	18.3 <sup>20</sup>	16.87 <sup>98</sup>	30.8 <sup>21</sup>	39.39 <sup>23</sup>	40.0 <sup>10</sup>
16.8	24.75 <sup>27</sup> 29	28.6 <sup>13</sup> 15	4.56 <sup>32</sup> 34	16.2 <sup>21</sup> 19	18.02 <sup>115</sup> 127	29.3 <sup>15</sup> 10	39.65 <sup>26</sup> 28	38.7 <sup>13</sup> 15
26.8	25.04	27.1	4.90	14.3	19.29	28.3	39.93	37.2
Nov. 5.8	25.35 <sup>31</sup>	25.5 <sup>16</sup>	5.27 <sup>37</sup>	12.4 <sup>19</sup>	20.66 <sup>137</sup>	27.9 <sup>4</sup>	40.24 <sup>31</sup>	35.6 <sup>16</sup>
15.7	25.67 <sup>32</sup>	23.8 <sup>17</sup>	5.65 <sup>38</sup>	10.6 <sup>18</sup>	22.07 <sup>141</sup>	28.2 <sup>3</sup>	40.57 <sup>33</sup>	33.8 <sup>18</sup>
25.7	26.01 <sup>34</sup>	21.9 <sup>19</sup>	6.05 <sup>40</sup>	9.1 <sup>15</sup>	23.46 <sup>139</sup>	29.2 <sup>10</sup>	40.90 <sup>33</sup>	31.9 <sup>19</sup>
Dec. 5.7	26.35 <sup>34</sup> 32	20.1 <sup>18</sup> 18	6.45 <sup>40</sup> 38	7.8 <sup>13</sup> 9	24.80 <sup>134</sup> 123	30.8 <sup>16</sup> 23	41.24 <sup>34</sup> 32	30.0 <sup>19</sup> 18
15.7	26.67	18.3	6.83	6.9	26.03	33.1	41.56	28.2
25.6	26.98 <sup>31</sup>	16.6 <sup>17</sup>	7.19 <sup>36</sup>	6.2 <sup>7</sup>	27.11 <sup>108</sup>	35.8 <sup>27</sup>	41.87 <sup>31</sup>	26.4 <sup>18</sup>
35.6	27.26 <sup>28</sup>	15.1 <sup>15</sup>	7.52 <sup>33</sup>	5.9 <sup>3</sup>	28.00 <sup>89</sup>	39.0 <sup>32</sup>	42.16 <sup>29</sup>	24.8 <sup>16</sup>
Δ, Tan δ	1.021	+0.207	1.248	+0.747	6.097	−6.015	1.016	+0.181
an Place	21°.973	36''.59	1°.282	32''.30	25°.656	34''.39	36°.960	46''.82
α, D <sub>α</sub> α	0.00	+0.01	+0.01	+0.04	−0.09	−0.32	0.00	+0.01
δ, D <sub>δ</sub> δ	−0.3	+0.6	−0.3	+0.6	−0.3	+0.6	−0.3	+0.6



FOR THE UPPER TRANSIT AT

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FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\phi$ Argus. Mag. 3.7		$\pi$ Leonis. Mag. 4.9		$\eta$ Leonis. Mag. 3.6		$\alpha$ Leonis. (Regulus.) Mag. 1.3	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 9 53 s	° ' — 54 9 "	h m 9 55 s	° ' + 8 26 "	h m 10 2 s	° ' + 17 10 "	h m 10 3 s	° ' + 12 22 "
Jan. 0.6	53.87	34.4	44.90	66.1	43.56	33.9	52.36	54.6
10.6	54.21 34	37.9 35	45.17 27	64.5 16	43.85 29	32.6 13	52.65 29	53.1 15
20.6	54.47 26	41.5 36	45.41 24	63.0 15	44.10 25	31.6 10	52.89 24	51.9 12
30.6	54.67 20	45.3 38	45.60 19	61.8 12	44.31 21	30.9 7	53.09 20	50.9 10
Feb. 9.5	54.80 13 5	49.1 38 37	45.74 14 9	60.9 9 7	44.46 15 11	30.5 4 2	53.24 15 11	50.2 7 5
19.5	54.85	52.8	45.83	60.2	44.57	30.3	53.35	49.7
Mar. 1.5	54.83 2	56.3 35	45.88 5	59.8 4	44.62 5	30.4 1	53.40 5	49.5 2
11.4	54.75 8	59.6 33	45.88 0	59.6 2	44.63 1	30.7 3	53.41 1	49.5 0
21.4	54.61 14	62.6 30	45.84 4	59.5 1	44.59 4	31.2 5	53.37 4	49.7 2
31.4	54.42 19 22	65.2 26 23	45.77 7 10	59.7 2 2	44.52 7 10	31.8 6 6	53.31 6 10	50.1 4 4
Apr. 10.4	54.20	67.5	45.67	59.9	44.42	32.4	53.21	50.5
20.3	53.94 26	69.2 17	45.56 11	60.3 4	44.31 11	33.1 7	53.10 11	51.0 5
30.3	53.67 27	70.5 13	45.44 12	60.7 4	44.19 12	33.7 6	52.98 12	51.5 5
May 10.3	53.39 28	71.4 9	45.32 12	61.2 5	44.06 13	34.3 6	52.86 12	52.1 6
20.3	53.11 28 28	71.7 3 2	45.20 12 11	61.6 4 5	43.94 12 12	34.8 5 5	52.74 12 11	52.6 5 5
30.2	52.83	71.5 6	45.09	62.1	43.82	35.3	52.63	53.1
June 9.2	52.57 26	70.9 6	45.00 9	62.6 5	43.72 10	35.7 4	52.53 10	53.5 4
19.2	52.33 24	69.8 11	44.92 8	63.1 5	43.64 8	35.9 2	52.45 8	53.9 4
29.1	52.12 21	68.2 16	44.86 6	63.5 4	43.58 6	36.0 1	52.39 6	54.2 3
July 9.1	51.94 18 14	66.3 19 22	44.83 3 1	63.9 4 3	43.54 4 2	36.0 0 1	52.35 4 2	54.4 2 1
19.1	51.80	64.1	44.82	64.2	43.52	35.9	52.33	54.5
29.1	51.71 9	61.6 25	44.83 1	64.4 2	43.53 1	35.7 2	52.34 1	54.5 0
Aug. 8.0	51.66 5	58.9 27	44.86 3	64.5 1	43.56 3	35.3 4	52.37 3	54.4 1
18.0	51.67 1	56.1 28	44.93 7	64.4 1	43.62 6	34.7 6	52.42 5	54.1 3
28.0	51.74 7 12	53.4 27 27	45.02 9 12	64.2 2 3	43.71 9 12	34.0 7 9	52.51 9 11	53.7 4 6
Sept. 7.0	51.86	50.7	45.14	63.9	43.83	33.1	52.62	53.1
16.9	52.05 19	48.3 24	45.29 15	63.3 6	43.98 15	32.0 11	52.77 15	52.3 8
26.9	52.30 25	46.3 20	45.48 19	62.5 8	44.16 18	30.8 12	52.95 18	51.2 11
Oct. 6.9	52.60 30	44.6 17	45.69 21	61.5 10	44.37 21	29.3 15	53.16 21	50.0 12
16.8	52.96 36 40	43.5 11 6	45.93 24 28	60.3 12 15	44.62 25 27	27.7 16 18	53.40 24 27	48.6 14 17
26.8	53.36	42.9	46.21	58.8	44.89	25.9	53.67	46.9
Nov. 5.8	53.80 44	42.9 0	46.51 30	57.1 17	45.20 31	24.1 18	53.96 29	45.2 17
15.8	54.27 47	43.5 6	46.83 32	55.3 18	45.52 32	22.1 20	54.28 32	43.3 19
25.7	54.74 47	44.8 13	47.16 33	53.4 19	45.86 34	20.2 19	54.62 34	41.4 10
Dec. 5.7	55.21 47 45	46.7 19 24	47.49 33 33	51.4 20 20	46.21 35 35	18.3 19 18	54.96 34 34	39.4 20 10
15.7	55.66	49.1	47.82	49.4	46.56	16.5	55.30	37.5
25.7	56.08 42	52.0 29	48.14 32	47.5 19	46.89 33	14.8 17	55.62 32	35.7 18
35.6	56.44 36	55.3 33	48.44 30	45.8 17	47.20 31	13.4 14	55.92 30	34.0 17
Sec $\delta$ . Tan $\delta$	1.708	—1.385	1.011	+0.149	1.047	+0.309	1.024	+0.220
Mean Place	52° 55' 56"	46'' .90	43° 37' 5"	60'' .09	41° 55' 1"	39'' .51	50° 58' 25"	59'' .05
D' $\psi$ $\alpha$ , D $\omega$ $\alpha$	—0.02	—0.08	0.00	+0.01	0.00	+0.02	0.00	+0.01
D $\psi$ $\delta$ , D $\omega$ $\delta$	—0.3	+0.5	—0.3	+0.5	—0.3	+0.5	—0.3	+0.5

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	λ Hydræ. Mag. 3.8		γ Velorum. Mag. 4.1		32 Ursæ Majoris. Mag. 5.7		ζ Leonis. Mag. 3.6	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 10 6	° ' -11 55	h m 10 11	° ' -41 41	h m 10 11	° ' +65 31	h m 10 11	° ' +23 50
	s	"	s	"	s	"	s	"
Jan. 0.6	27.94	58.2	11.01	51.7	56.34	43.1	59.63	21.0
10.6	28.22 <sup>28</sup>	60.7 <sup>25</sup>	11.32 <sup>31</sup>	54.9 <sup>32</sup>	56.91 <sup>57</sup>	44.0 <sup>9</sup>	59.93 <sup>30</sup>	20.0 <sup>10</sup>
20.6	28.45 <sup>23</sup>	63.1 <sup>24</sup>	11.58 <sup>26</sup>	58.3 <sup>34</sup>	57.40 <sup>49</sup>	45.3 <sup>13</sup>	60.20 <sup>27</sup>	19.3 <sup>7</sup>
30.6	28.64 <sup>19</sup>	65.4 <sup>23</sup>	11.79 <sup>21</sup>	61.8 <sup>35</sup>	57.80 <sup>40</sup>	47.1 <sup>18</sup>	60.43 <sup>23</sup>	19.0 <sup>3</sup>
Feb. 9.5	28.79 <sup>15</sup>	67.6 <sup>22</sup>	11.94 <sup>15</sup>	65.2 <sup>34</sup>	58.10 <sup>30</sup>	49.3 <sup>22</sup>	60.60 <sup>17</sup>	19.0 <sup>0</sup>
	9	19	9	33	19	24	11	2
19.5	28.88	69.5	12.03	68.5	58.29	51.7	60.71	19.2
Mar. 1.5	28.92 <sup>4</sup>	71.2 <sup>17</sup>	12.06 <sup>3</sup>	71.7 <sup>32</sup>	58.37 <sup>8</sup>	54.3 <sup>26</sup>	60.78 <sup>7</sup>	19.7 <sup>5</sup>
11.5	28.93 <sup>1</sup>	72.6 <sup>14</sup>	12.03 <sup>3</sup>	74.6 <sup>29</sup>	58.34 <sup>3</sup>	56.9 <sup>26</sup>	60.79 <sup>1</sup>	20.4 <sup>7</sup>
21.4	28.89 <sup>4</sup>	73.8 <sup>12</sup>	11.97 <sup>6</sup>	77.3 <sup>27</sup>	58.21 <sup>13</sup>	59.4 <sup>25</sup>	60.76 <sup>3</sup>	21.2 <sup>8</sup>
31.4	28.82 <sup>7</sup>	74.7 <sup>9</sup>	11.86 <sup>11</sup>	79.6 <sup>23</sup>	57.99 <sup>22</sup>	61.7 <sup>23</sup>	60.70 <sup>6</sup>	22.1 <sup>9</sup>
	9	6	15	19	29	21	10	10
Apr. 10.4	28.73	75.3	11.71	81.5	57.70	63.8	60.60	23.1
20.3	28.62 <sup>11</sup>	75.7 <sup>4</sup>	11.55 <sup>16</sup>	83.1 <sup>16</sup>	57.36 <sup>34</sup>	65.5 <sup>17</sup>	60.49 <sup>11</sup>	24.0 <sup>9</sup>
30.3	28.50 <sup>12</sup>	75.8 <sup>1</sup>	11.37 <sup>18</sup>	84.2 <sup>11</sup>	56.98 <sup>38</sup>	66.8 <sup>13</sup>	60.36 <sup>13</sup>	24.8 <sup>8</sup>
May 10.3	28.37 <sup>13</sup>	75.8 <sup>0</sup>	11.18 <sup>19</sup>	84.9 <sup>7</sup>	56.58 <sup>40</sup>	67.7 <sup>9</sup>	60.22 <sup>14</sup>	25.5 <sup>7</sup>
20.3	28.25 <sup>12</sup>	75.5 <sup>3</sup>	10.99 <sup>19</sup>	85.1 <sup>2</sup>	56.18 <sup>40</sup>	68.1 <sup>4</sup>	60.09 <sup>13</sup>	26.1 <sup>6</sup>
	11	5	19	1	39	2	12	4
30.2	28.14	75.0	10.80	85.0	55.79	67.9	59.97	26.5
June 9.2	28.04 <sup>10</sup>	74.3 <sup>7</sup>	10.62 <sup>18</sup>	84.4 <sup>6</sup>	55.43 <sup>36</sup>	67.3 <sup>6</sup>	59.86 <sup>11</sup>	26.8 <sup>3</sup>
19.2	27.95 <sup>9</sup>	73.5 <sup>8</sup>	10.46 <sup>16</sup>	83.4 <sup>10</sup>	55.11 <sup>32</sup>	66.2 <sup>11</sup>	59.77 <sup>9</sup>	26.9 <sup>1</sup>
29.2	27.88 <sup>7</sup>	72.5 <sup>10</sup>	10.31 <sup>15</sup>	82.1 <sup>13</sup>	54.83 <sup>28</sup>	64.7 <sup>15</sup>	59.70 <sup>7</sup>	26.8 <sup>1</sup>
July 9.1	27.82 <sup>6</sup>	71.5 <sup>10</sup>	10.19 <sup>12</sup>	80.4 <sup>17</sup>	54.61 <sup>22</sup>	62.8 <sup>19</sup>	59.65 <sup>5</sup>	26.6 <sup>2</sup>
	3	12	10	20	17	23	3	4
19.1	27.79	70.3	10.09	78.4	54.44	60.5	59.62	26.2
29.1	27.78 <sup>1</sup>	69.1 <sup>12</sup>	10.03 <sup>6</sup>	76.3 <sup>21</sup>	54.35 <sup>9</sup>	57.9 <sup>26</sup>	59.61 <sup>1</sup>	25.6 <sup>6</sup>
Aug. 8.0	27.80 <sup>2</sup>	68.0 <sup>11</sup>	10.00 <sup>3</sup>	74.0 <sup>23</sup>	54.32 <sup>3</sup>	55.1 <sup>28</sup>	59.64 <sup>3</sup>	24.8 <sup>8</sup>
18.0	27.84 <sup>4</sup>	66.9 <sup>11</sup>	10.01 <sup>1</sup>	71.6 <sup>24</sup>	54.36 <sup>4</sup>	52.0 <sup>31</sup>	59.69 <sup>5</sup>	23.8 <sup>10</sup>
28.0	27.92 <sup>8</sup>	65.9 <sup>10</sup>	10.06 <sup>5</sup>	69.2 <sup>24</sup>	54.47 <sup>11</sup>	48.8 <sup>32</sup>	59.77 <sup>8</sup>	22.7 <sup>11</sup>
	10	8	10	22	18	32	11	13
Sept. 7.0	28.02	65.1	10.16	67.0	54.65	45.6	59.88	21.4
16.9	28.16 <sup>14</sup>	64.5 <sup>6</sup>	10.30 <sup>14</sup>	65.0 <sup>20</sup>	54.91 <sup>26</sup>	42.3 <sup>33</sup>	60.03 <sup>15</sup>	19.9 <sup>15</sup>
26.9	28.33 <sup>17</sup>	64.2 <sup>3</sup>	10.49 <sup>19</sup>	63.3 <sup>17</sup>	55.24 <sup>33</sup>	39.1 <sup>32</sup>	60.21 <sup>18</sup>	18.3 <sup>16</sup>
Oct. 6.9	28.53 <sup>20</sup>	64.3 <sup>1</sup>	10.73 <sup>24</sup>	62.0 <sup>13</sup>	55.64 <sup>40</sup>	35.9 <sup>32</sup>	60.42 <sup>21</sup>	16.5 <sup>18</sup>
16.9	28.76 <sup>23</sup>	64.7 <sup>4</sup>	11.01 <sup>28</sup>	61.1 <sup>9</sup>	56.10 <sup>46</sup>	33.0 <sup>29</sup>	60.66 <sup>24</sup>	14.6 <sup>19</sup>
	27	8	33	4	53	27	28	20
26.8	29.03	65.5	11.34	60.7	56.63	30.3	60.94	12.6
Nov. 5.8	29.33 <sup>30</sup>	66.6 <sup>11</sup>	11.69 <sup>35</sup>	60.9 <sup>2</sup>	57.21 <sup>58</sup>	27.9 <sup>24</sup>	61.26 <sup>32</sup>	10.6 <sup>20</sup>
15.8	29.65 <sup>32</sup>	68.1 <sup>15</sup>	12.07 <sup>38</sup>	61.7 <sup>8</sup>	57.84 <sup>63</sup>	25.8 <sup>21</sup>	61.59 <sup>33</sup>	8.5 <sup>21</sup>
25.7	29.98 <sup>33</sup>	69.9 <sup>18</sup>	12.47 <sup>40</sup>	63.0 <sup>13</sup>	58.50 <sup>66</sup>	24.2 <sup>16</sup>	61.94 <sup>35</sup>	6.5 <sup>20</sup>
Dec. 5.7	30.31 <sup>33</sup>	72.0 <sup>21</sup>	12.87 <sup>40</sup>	64.9 <sup>19</sup>	59.17 <sup>67</sup>	23.1 <sup>11</sup>	62.30 <sup>36</sup>	4.7 <sup>18</sup>
	33	23	39	24	67	5	36	17
15.7	30.64	74.3	13.26	67.3	59.84	22.6	62.66	3.0
25.7	30.96 <sup>32</sup>	76.8 <sup>25</sup>	13.63 <sup>37</sup>	70.0 <sup>27</sup>	60.49 <sup>65</sup>	22.5 <sup>1</sup>	63.00 <sup>34</sup>	1.5 <sup>15</sup>
35.6	31.25 <sup>29</sup>	79.3 <sup>25</sup>	13.97 <sup>34</sup>	73.1 <sup>31</sup>	61.08 <sup>59</sup>	23.0 <sup>5</sup>	63.33 <sup>33</sup>	0.3 <sup>12</sup>
Sec δ, Tan δ	1.022	-0.211	1.339	-0.891	2.414	+2.197	1.093	+0.442
Mean Place	26°.654	60''.44	9°.860	61''.69	52°.653	58''.59	57°.954	28''.88
D'α, Dα	0.00	-0.01	-0.01	-0.05	+0.03	+0.13	+0.01	+0.03
Dδ, Dδ	-0.3	+0.5	-0.4	+0.5	-0.4	+0.5	-0.4	+0.5



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Hydræ. Mag. 4.1		31 Leonis Minoris. Mag. 4.4		$\alpha$ Antlæ. Mag. 4.4		38 Ursæ Majoris. Mag. 4.8	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 10 21 s	° ' — 16 24 "	h m 10 22 s	° ' + 37 8 "	h m 10 23 s	° ' — 30 37 "	h m 10 25 s	° ' + 56 24 "
an. 0.7	59.92	3.8	60.33	23.5	16.73	58.7	14.56	45.1
10.6	60.20 <sup>28</sup>	6.4 <sup>26</sup>	60.68 <sup>35</sup>	23.0 <sup>5</sup>	17.03 <sup>30</sup>	61.7 <sup>30</sup>	15.02 <sup>46</sup>	45.5 <sup>4</sup>
20.6	60.45 <sup>25</sup>	9.1 <sup>27</sup>	60.98 <sup>30</sup>	22.9 <sup>1</sup>	17.29 <sup>26</sup>	64.8 <sup>31</sup>	15.43 <sup>41</sup>	46.3 <sup>8</sup>
30.6	60.66 <sup>21</sup>	11.6 <sup>25</sup>	61.24 <sup>26</sup>	23.2 <sup>3</sup>	17.50 <sup>21</sup>	67.9 <sup>31</sup>	15.77 <sup>34</sup>	47.6 <sup>13</sup>
eb. 9.5	60.82 <sup>16</sup>	14.0 <sup>24</sup>	61.44 <sup>20</sup>	23.9 <sup>7</sup>	17.66 <sup>16</sup>	71.0 <sup>31</sup>	16.03 <sup>26</sup>	49.3 <sup>17</sup>
	11	22	14	11	11	29	18	20
19.5	60.93	16.2	61.58	25.0	17.77	73.9	16.21	51.3
ar. 1.5	60.99	18.2 <sup>20</sup>	61.66	26.2 <sup>12</sup>	17.83	76.6 <sup>27</sup>	16.31 <sup>10</sup>	53.5 <sup>22</sup>
11.5	61.00 <sup>1</sup>	19.9 <sup>17</sup>	61.69 <sup>3</sup>	27.6 <sup>14</sup>	17.84 <sup>1</sup>	79.0 <sup>24</sup>	16.32 <sup>1</sup>	55.8 <sup>23</sup>
21.4	60.98 <sup>2</sup>	21.3 <sup>14</sup>	61.66 <sup>3</sup>	29.2 <sup>16</sup>	17.80 <sup>4</sup>	81.2 <sup>22</sup>	16.26 <sup>6</sup>	58.1 <sup>23</sup>
31.4	60.92 <sup>6</sup>	22.5 <sup>12</sup>	61.59 <sup>7</sup>	30.7 <sup>15</sup>	17.73 <sup>7</sup>	83.1 <sup>19</sup>	16.13 <sup>13</sup>	60.3 <sup>22</sup>
	8	9	11	15	10	15	18	20
pr. 10.4	60.84	23.4	61.48	32.2	17.63	84.6	15.95	62.3
20.4	60.74 <sup>10</sup>	24.0 <sup>6</sup>	61.34 <sup>14</sup>	33.5 <sup>13</sup>	17.51 <sup>12</sup>	85.8 <sup>12</sup>	15.72 <sup>23</sup>	64.1 <sup>18</sup>
30.3	60.62 <sup>12</sup>	24.3 <sup>3</sup>	61.19 <sup>15</sup>	34.7 <sup>12</sup>	17.37 <sup>14</sup>	86.7 <sup>9</sup>	15.46 <sup>26</sup>	65.5 <sup>14</sup>
ay 10.3	60.50 <sup>12</sup>	24.4 <sup>1</sup>	61.03 <sup>16</sup>	35.6 <sup>9</sup>	17.23 <sup>14</sup>	87.2 <sup>5</sup>	15.19 <sup>27</sup>	66.6 <sup>11</sup>
20.3	60.38 <sup>12</sup>	24.2 <sup>2</sup>	60.86 <sup>17</sup>	36.3 <sup>7</sup>	17.08 <sup>15</sup>	87.3 <sup>1</sup>	14.92 <sup>27</sup>	67.2 <sup>6</sup>
	12	4	15	4	15	2	27	1
30.2	60.26	23.8	60.71	36.7	16.93	87.1	14.65	67.3
ine 9.2	60.15 <sup>11</sup>	23.2 <sup>6</sup>	60.57 <sup>14</sup>	36.8 <sup>1</sup>	16.79 <sup>14</sup>	86.5 <sup>6</sup>	14.40 <sup>25</sup>	67.1 <sup>2</sup>
19.2	60.05 <sup>10</sup>	22.4 <sup>8</sup>	60.44 <sup>13</sup>	36.6 <sup>2</sup>	16.67 <sup>12</sup>	85.7 <sup>8</sup>	14.17 <sup>23</sup>	66.4 <sup>7</sup>
29.2	59.97 <sup>8</sup>	21.4 <sup>10</sup>	60.34 <sup>10</sup>	36.1 <sup>5</sup>	16.56 <sup>11</sup>	84.5 <sup>12</sup>	13.98 <sup>19</sup>	65.3 <sup>11</sup>
ily 9.1	59.90 <sup>7</sup>	20.3 <sup>11</sup>	60.25 <sup>9</sup>	35.4 <sup>7</sup>	16.46 <sup>10</sup>	83.0 <sup>15</sup>	13.82 <sup>16</sup>	63.8 <sup>15</sup>
	5	13	5	10	7	16	12	18
19.1	59.85	19.0	60.20	34.4	16.39	81.4	13.70	62.0
29.1	59.83 <sup>2</sup>	17.7 <sup>13</sup>	60.18 <sup>2</sup>	33.1 <sup>13</sup>	16.34 <sup>5</sup>	79.6 <sup>18</sup>	13.63 <sup>7</sup>	59.8 <sup>22</sup>
ug. 8.1	59.83 <sup>0</sup>	16.4 <sup>13</sup>	60.19 <sup>1</sup>	31.6 <sup>15</sup>	16.32 <sup>2</sup>	77.7 <sup>19</sup>	13.60 <sup>3</sup>	57.4 <sup>24</sup>
18.0	59.85 <sup>2</sup>	15.1 <sup>13</sup>	60.22 <sup>3</sup>	29.9 <sup>17</sup>	16.34 <sup>2</sup>	75.8 <sup>19</sup>	13.63 <sup>3</sup>	54.7 <sup>27</sup>
28.0	59.91 <sup>6</sup>	13.9 <sup>12</sup>	60.29 <sup>7</sup>	28.0 <sup>19</sup>	16.38 <sup>4</sup>	73.9 <sup>19</sup>	13.70 <sup>7</sup>	51.9 <sup>28</sup>
	9	10	11	21	9	18	13	30
pt. 7.0	60.00	12.9	60.40	25.9	16.47	72.1	13.83	48.9
16.9	60.12 <sup>12</sup>	12.1 <sup>8</sup>	60.55 <sup>15</sup>	23.7 <sup>22</sup>	16.59 <sup>12</sup>	70.6 <sup>15</sup>	14.01 <sup>18</sup>	45.9 <sup>30</sup>
26.9	60.28 <sup>16</sup>	11.6 <sup>5</sup>	60.73 <sup>18</sup>	21.4 <sup>23</sup>	16.76 <sup>17</sup>	69.3 <sup>13</sup>	14.24 <sup>23</sup>	42.8 <sup>31</sup>
ct. 6.9	60.47 <sup>19</sup>	11.4 <sup>2</sup>	60.96 <sup>23</sup>	19.0 <sup>24</sup>	16.96 <sup>20</sup>	68.4 <sup>9</sup>	14.53 <sup>29</sup>	39.8 <sup>30</sup>
16.9	60.70 <sup>23</sup>	11.5 <sup>1</sup>	61.22 <sup>26</sup>	16.6 <sup>24</sup>	17.21 <sup>25</sup>	67.9 <sup>5</sup>	14.88 <sup>35</sup>	36.9 <sup>29</sup>
	26	6	30	24	28	0	39	28
26.8	60.96	12.1	61.52	14.2	17.49	67.9	15.27	34.1
ov. 5.8	61.25 <sup>29</sup>	13.0 <sup>9</sup>	61.86 <sup>34</sup>	11.8 <sup>24</sup>	17.80 <sup>31</sup>	68.4 <sup>5</sup>	15.71 <sup>44</sup>	31.5 <sup>26</sup>
15.8	61.57 <sup>32</sup>	14.4 <sup>14</sup>	62.22 <sup>36</sup>	9.6 <sup>22</sup>	18.14 <sup>34</sup>	69.4 <sup>10</sup>	16.19 <sup>48</sup>	29.3 <sup>22</sup>
25.8	61.90 <sup>33</sup>	16.1 <sup>17</sup>	62.61 <sup>39</sup>	7.6 <sup>20</sup>	18.50 <sup>36</sup>	70.8 <sup>14</sup>	16.70 <sup>51</sup>	27.4 <sup>19</sup>
ec. 5.7	62.25 <sup>35</sup>	18.2 <sup>21</sup>	63.00 <sup>39</sup>	5.8 <sup>18</sup>	18.87 <sup>37</sup>	72.7 <sup>19</sup>	17.23 <sup>53</sup>	25.9 <sup>15</sup>
	34	23	40	15	36	23	53	10
15.7	62.59	20.5	63.40	4.3	19.23	75.0	17.76	24.9
25.7	62.91 <sup>32</sup>	22.9 <sup>24</sup>	63.79 <sup>39</sup>	3.2 <sup>11</sup>	19.58 <sup>35</sup>	77.7 <sup>27</sup>	18.27 <sup>51</sup>	24.4 <sup>5</sup>
35.6	63.22 <sup>31</sup>	25.5 <sup>26</sup>	64.15 <sup>36</sup>	2.5 <sup>7</sup>	19.90 <sup>32</sup>	80.5 <sup>28</sup>	18.75 <sup>48</sup>	24.4 <sup>0</sup>
$\delta$ , Tan $\delta$ n Place	1.042 58°.735	—0.294 7''.03	1.254 58°.420	+0.757 35''.19	1.162 15°.630	—0.592 65''.93	1.808 11°.852	+1.506 60''.55
$\alpha$ , D <sub>a</sub> $\alpha$	0.00	—0.02	+0.01	+0.05	—0.01	—0.04	+0.02	+0.09
$\delta$ , D <sub>a</sub> $\delta$	—0.4	+0.4	—0.4	+0.4	—0.4	+0.4	—0.4	+0.4

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	9 H. Draconis. Mag. 5.0		ρ Leonis. Mag. 3.8		33 Sextantis. Mag. 6.4		41 Leonis Minoris. Mag. 5.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 10 27 s	° ' +76 8 "	h m 10 28 s	° ' + 9 44 "	h m 10 37 s	° ' - 1 17 "	h m 10 38 s	° ' +23 37 "
Jan. 0.7	60.17	47.4	21.62	35.1	5.96	40.9	49.37	52.2
10.6	61.10 93	48.4 10	21.92 30	33.4 17	6.25 29	43.0 21	49.69 32	51.1 11
20.6	61.92 82	50.0 16	22.18 26	31.9 15	6.51 26	45.0 20	49.98 29	50.2 9
30.6	62.60 68	52.1 21	22.40 22	30.7 12	6.73 22	46.8 18	50.22 24	49.7 5
Feb. 9.6	63.11 51	54.5 24	22.57 17	29.7 10	6.91 18	48.4 16	50.42 20	49.6 2
	33	27	12	6	13	14	14	2
19.5	63.44	57.2	22.69	29.1	7.04	49.8	50.56	49.8
Mar. 1.5	63.58 14	60.1 29	22.77 8	28.7 4	7.12 8	50.9 11	50.66 10	50.2 4
11.5	63.54 4	63.0 29	22.81 4	28.5 2	7.16 4	51.7 8	50.70 4	50.9 7
21.4	63.33 21	65.8 28	22.80 1	28.6 1	7.16 0	52.3 6	50.69 1	51.7 8
31.4	62.96 37	68.4 26	22.75 5	28.8 2	7.12 4	52.7 4	50.65 4	52.7 10
	50	23	7	4	6	1	7	10
Apr. 10.4	62.46	70.7	22.68	29.2	7.06	52.8	50.58	53.7
20.4	61.85 61	72.7 20	22.59 9	29.7 5	6.97 9	52.8 0	50.48 10	54.7 10
30.3	61.16 69	74.1 14	22.48 11	30.2 5	6.87 10	52.7 1	50.37 11	55.7 10
May 10.3	60.42 74	75.1 10	22.37 11	30.7 5	6.77 10	52.4 3	50.24 13	56.5 8
20.3	59.66 76	75.5 4	22.26 11	31.3 6	6.66 11	52.0 4	50.12 12	57.3 8
	76	1	11	5	10	5	12	6
30.3	58.90	75.4	22.15	31.8	6.56	51.5	50.00	57.9
June 9.2	58.18 72	74.7 7	22.05 10	32.3 5	6.46 10	50.9 6	49.88 12	58.3 4
19.2	57.51 67	73.5 12	21.96 9	32.8 5	6.37 9	50.3 6	49.78 10	58.5 2
29.2	56.91 60	71.8 17	21.89 7	33.2 4	6.29 8	49.7 6	49.69 9	58.6 1
July 9.1	56.40 51	69.7 21	21.83 6	33.5 3	6.23 6	49.0 7	49.62 7	58.4 2
	41	25	3	2	5	7	5	4
19.1	55.99	67.2	21.80	33.7	6.18	48.3	49.57	58.0
29.1	55.69 30	64.3 29	21.78 2	33.9 2	6.16 2	47.7 6	49.54 3	57.5 5
Aug. 8.1	55.51 18	61.2 31	21.79 1	33.9 0	6.15 1	47.1 6	49.54 0	56.8 7
	6	34	3	2	2	5	2	10
18.0	55.45	57.8	21.82	33.7	6.17	46.6	49.56	55.8
28.0	55.52 7	54.3 35	21.88 6	33.4 3	6.22 5	46.3 3	49.61 5	54.7 11
	20	36	9	5	8	1	8	14
Sept. 7.0	55.72	50.7	21.97	32.9	6.30	46.2	49.69	53.3
17.0	56.04 32	47.1 36	22.09 12	32.2 7	6.41 11	46.2 0	49.81 12	51.8 15
26.9	56.50 46	43.5 36	22.24 15	31.3 9	6.55 14	46.5 3	49.96 15	50.1 17
Oct. 6.9	57.08 58	40.1 34	22.43 19	30.1 12	6.72 17	47.1 6	50.14 18	48.2 19
16.9	57.77 69	36.9 32	22.65 22	28.7 14	6.93 21	48.0 9	50.37 23	46.2 20
	81	29	25	15	25	11	26	21
26.8	58.58	34.0	22.90	27.2	7.18	49.1	50.63	44.1
Nov. 5.8	59.48 90	31.5 25	23.19 29	25.4 18	7.46 28	50.6 15	50.92 29	42.0 21
15.8	60.46 98	29.3 22	23.50 31	23.5 19	7.76 30	52.3 17	51.24 32	39.8 22
25.8	61.50 104	27.7 16	23.82 32	21.4 21	8.08 32	54.2 19	51.58 34	37.6 23
Dec. 5.7	62.57 107	26.6 11	24.16 34	19.4 20	8.42 34	56.3 21	51.94 36	35.5 24
	108	5	34	20	33	22	36	18
15.7	63.65	26.1	24.50	17.4	8.75	58.5	52.30	33.7
25.7	64.69 104	26.2 1	24.83 33	15.4 20	9.08 33	60.7 22	52.65 35	32.0 17
35.7	65.68 99	26.9 7	25.15 32	13.6 18	9.39 31	62.9 22	52.99 34	30.6 14
Sec δ, Tan δ	4.177	+4.055	1.015	+0.172	1.000	-0.023	1.092	+0.438
Mean Place	54°.385	64''.96	20°.236	39''.87	4°.733	39''.07	47°.842	61''.50
D'ψ α, Dω α	+0.04	+0.25	0.00	+0.01	0.00	0.00	0.00	+0.03
Dψ δ, Dω δ	-0.4	+0.4	-0.4	+0.4	-0.4	+0.4	-0.4	+0.3

FOR THE UPPER TRANSIT, AT WASHINGTON.

Mean Solar Date.	$\theta$ Argus. Mag. 3.0		42 Leonis Minoris. Mag. 5.4		$\eta$ Argus. Var. 1.6-6.6		$\mu$ Argus. Mag. 2.8	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 10 39 s	° ' " -63 56 "	h m 10 41 s	° ' " +31 7 "	h m 10 41 s	° ' " -59 14 "	h m 10 43 s	° ' " -48 58 "
Jan. 0.7	56.18	43.5	10.18	37.8	46.52	1.1	7.53	4.3
10.6	56.66 48	46.6 31	10.52 34	36.9 9	46.95 43	4.2 31	7.90 37	7.4 31
20.6	57.08 42	50.0 34	10.83 31	36.4 5	47.33 38	7.6 34	8.23 33	10.7 33
30.6	57.41 33	53.7 37	11.09 26	36.3 1	47.63 30	11.3 37	8.49 26	14.2 35
Feb. 9.6	57.65 24 15	57.5 38 39	11.30 21 15	36.6 3 6	47.86 23 15	15.0 37 38	8.69 20 14	17.8 36 36
19.5	57.80	61.4	11.45	37.2	48.01	18.8	8.83	21.4
Mar. 1.5	57.86 6	65.3 39	11.55 10	38.1 9	48.08 7	22.6 38	8.91 8	24.9 35
11.5	57.84 2	69.0 37	11.59 4	39.2 11	48.08 0	26.2 36	8.93 2	28.2 33
21.4	57.74 10	72.5 35	11.59 0	40.5 13	48.00 8	29.6 34	8.89 4	31.3 31
31.4	57.58 16 23	75.8 33 29	11.54 5 8	41.8 13 13	47.87 13 18	32.7 31 28	8.81 8 13	34.0 27 25
Apr. 10.4	57.35	78.7	11.46	43.1	47.69	35.5	8.68	36.5
20.4	57.07 28	81.2 25	11.36 10	44.4 13	47.46 23	37.9 24	8.52 16	38.5 20
30.3	56.75 32	83.3 21	11.23 13	45.6 12	47.20 26	39.9 20	8.34 18	40.1 16
May 10.3	56.40 35	84.9 16	11.09 14	46.6 10	46.91 29	41.4 15	8.13 21	41.4 13
20.3	56.03 37 39	86.0 11 6	10.95 14 14	47.4 8 5	46.61 30 31	42.4 10 5	7.92 21 22	42.1 7 3
30.3	55.64	86.6	10.81	47.9	46.30	42.9	7.70	42.4
June 9.2	55.26 38	86.6 0	10.68 13	48.3 4	45.99 31	42.9 0	7.49 21	42.2 2
19.2	54.89 37	86.2 4	10.57 11	48.4 1	45.69 30	42.4 5	7.28 21	41.6 6
29.2	54.54 35	85.3 9	10.47 10	48.2 2	45.40 29	41.4 10	7.09 19	40.6 10
July 9.1	54.22 32 29	83.8 15 18	10.39 8 6	47.8 4 7	45.14 26 23	40.0 14 18	6.91 18 15	39.2 14 18
19.1	53.93	82.0	10.33	47.1	44.91	38.2	6.76	37.4
29.1	53.70 23	79.8 22	10.29 4	46.2 9	44.73 18	36.0 22	6.64 12	35.3 21
Aug. 8.1	53.53 17	77.3 25	10.28 1	45.0 12	44.59 14	33.5 25	6.55 9	33.0 23
18.0	53.42 11	74.6 27	10.30 2	43.6 14	44.51 8	30.8 27	6.51 4	30.6 24
28.0	53.38 4 5	71.7 29 29	10.35 5 8	42.1 15 18	44.49 2 5	28.1 27 28	6.51 0 6	28.1 25 25
Sept. 7.0	53.43	68.8	10.43	40.3	44.54	25.3	6.57	25.6
17.0	53.56 13	66.1 27	10.54 11	38.4 19	44.66 12	22.6 27	6.68 11	23.2 24
26.9	53.78 22	63.5 26	10.70 16	36.3 21	44.85 19	20.2 24	6.84 16	21.1 21
Oct. 6.9	54.09 31	61.2 23	10.89 19	34.1 22	45.12 27	18.1 21	7.07 23	19.4 17
16.9	54.48 39 46	59.4 18 13	11.12 23 27	31.8 23 24	45.47 35 40	16.4 17 12	7.35 28 33	18.0 14 8
26.8	54.94	58.1	11.39	29.4	45.87	15.2	7.68	17.2
Nov. 5.8	55.46 52	57.3 8	11.69 30	27.0 24	46.33 46	14.5 7	8.05 37	16.8 4
15.8	56.03 57	57.2 1	12.03 34	24.7 23	46.83 50	14.5 0	8.46 41	17.1 3
25.8	56.63 60	57.7 5	12.39 36	22.5 22	47.36 53	15.1 6	8.90 44	17.9 8
Dec. 5.7	57.24 61 60	58.8 11 18	12.76 37 38	20.5 20 17	47.90 54 54	16.3 12 18	9.35 45 44	19.4 15 20
15.7	57.84	60.6	13.14	18.8	48.44	18.1	9.79	21.4
25.7	58.42 58	62.9 23	13.51 37	17.3 15	48.95 51	20.5 24	10.22 43	23.8 24
35.7	58.94 52	65.8 29	13.87 36	16.2 11	49.42 47	23.4 29	10.62 40	26.7 29
Sec $\delta$ , Tan $\delta$	2.277	-2.046	1.168	+0.604	1.955	-1.680	1.524	-1.149
Mean Place	55°.223	57''.98	8°.529	49''.16	45°.592	14''.78	6°.611	15''.91
$D_{\phi} \delta$ , $D_{\alpha} \delta$	-0.02	-0.13	+0.01	+0.04	-0.01	-0.11	-0.01	-0.07
$D_{\phi} \delta$ , $D_{\alpha} \delta$	-0.4	+0.3	-0.4	+0.3	-0.4	+0.3	-0.4	+0.3



FOR THE UPPER TRANSIT AT



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	<i>d</i> Leonis. Mag. 5.0		<i>β</i> Ursæ Majoris. Mag. 2.4		<i>α</i> Ursæ Majoris. Mag. 2.0		<i>χ</i> Leonis. Mag. 4.7	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 10 56 s	° ' " + 4 4 "	h m 10 56 s	° ' " + 56 49 "	h m 10 58 s	° ' " + 62 11 "	h m 11 0 s	° ' " + 7 47 "
Jan. 0.7	11.45	22.5	45.74	60.1	32.46	77.9	39.20	39.7
10.7	11.76 <sup>31</sup>	20.5 <sup>20</sup>	46.23 <sup>49</sup>	60.1 <sup>0</sup>	33.02 <sup>56</sup>	78.0 <sup>1</sup>	39.51 <sup>31</sup>	37.8 <sup>19</sup>
20.6	12.04 <sup>28</sup>	18.7 <sup>18</sup>	46.68 <sup>45</sup>	60.7 <sup>6</sup>	33.52 <sup>50</sup>	78.8 <sup>8</sup>	39.80 <sup>29</sup>	36.1 <sup>17</sup>
30.6	12.28 <sup>24</sup>	17.1 <sup>16</sup>	47.06 <sup>38</sup>	61.7 <sup>10</sup>	33.96 <sup>44</sup>	80.0 <sup>12</sup>	40.04 <sup>24</sup>	34.7 <sup>14</sup>
Feb. 9.6	12.48 <sup>20</sup>	15.8 <sup>13</sup>	47.37 <sup>31</sup>	63.2 <sup>15</sup>	34.31 <sup>35</sup>	81.7 <sup>17</sup>	40.24 <sup>20</sup>	33.6 <sup>11</sup>
	15	10	23	19	26	21	16	8
19.5	12.63	14.8	47.60	65.1	34.57	83.8	40.40	32.8
Mar. 1.5	12.73 <sup>10</sup>	14.0 <sup>8</sup>	47.75 <sup>15</sup>	67.3 <sup>22</sup>	34.74 <sup>17</sup>	86.2 <sup>24</sup>	40.51 <sup>11</sup>	32.2 <sup>6</sup>
	6	5	7	23	7	26	6	3
11.5	12.79	13.5	47.82	69.6	34.81	88.8	40.57	31.9
21.5	12.81 <sup>2</sup>	13.2 <sup>3</sup>	47.81 <sup>1</sup>	72.1 <sup>25</sup>	34.79 <sup>2</sup>	91.4 <sup>26</sup>	40.59 <sup>2</sup>	31.9 <sup>0</sup>
31.4	12.79 <sup>2</sup>	13.1 <sup>1</sup>	47.73 <sup>8</sup>	74.5 <sup>24</sup>	34.69 <sup>10</sup>	93.9 <sup>25</sup>	40.58 <sup>1</sup>	32.0 <sup>1</sup>
	5	1	15	22	18	24	5	3
Apr. 10.4	12.74	13.2	47.58	76.7	34.51	96.3	40.53	32.3
20.4	12.67 <sup>7</sup>	13.5 <sup>3</sup>	47.39 <sup>19</sup>	78.8 <sup>21</sup>	34.27 <sup>24</sup>	98.4 <sup>21</sup>	40.46 <sup>7</sup>	32.7 <sup>4</sup>
30.4	12.58 <sup>9</sup>	13.8 <sup>3</sup>	47.16 <sup>23</sup>	80.5 <sup>17</sup>	33.98 <sup>29</sup>	100.2 <sup>18</sup>	40.37 <sup>9</sup>	33.2 <sup>5</sup>
May 10.3	12.49 <sup>9</sup>	14.3 <sup>5</sup>	46.90 <sup>26</sup>	81.9 <sup>14</sup>	33.67 <sup>31</sup>	101.6 <sup>14</sup>	40.28 <sup>9</sup>	33.8 <sup>6</sup>
20.3	12.39 <sup>10</sup>	14.8 <sup>5</sup>	46.63 <sup>27</sup>	82.8 <sup>9</sup>	33.33 <sup>34</sup>	102.6 <sup>10</sup>	40.17 <sup>11</sup>	34.4 <sup>6</sup>
	11	5	27	5	34	4	10	6
30.3	12.28	15.3	46.36	83.3	32.99	103.0	40.07	35.0
June 9.2	12.18 <sup>10</sup>	15.9 <sup>6</sup>	46.09 <sup>27</sup>	83.4 <sup>1</sup>	32.66 <sup>33</sup>	103.0 <sup>0</sup>	39.97 <sup>10</sup>	35.6 <sup>6</sup>
19.2	12.09 <sup>9</sup>	16.5 <sup>6</sup>	45.84 <sup>25</sup>	83.0 <sup>4</sup>	32.34 <sup>32</sup>	102.6 <sup>4</sup>	39.88 <sup>9</sup>	36.1 <sup>5</sup>
29.2	12.01 <sup>8</sup>	17.0 <sup>5</sup>	45.61 <sup>23</sup>	82.2 <sup>8</sup>	32.05 <sup>29</sup>	101.6 <sup>10</sup>	39.79 <sup>9</sup>	36.6 <sup>5</sup>
July 9.2	11.94 <sup>7</sup>	17.5 <sup>5</sup>	45.41 <sup>20</sup>	81.0 <sup>12</sup>	31.80 <sup>25</sup>	100.2 <sup>14</sup>	39.72 <sup>7</sup>	37.0 <sup>4</sup>
	5	5	16	16	21	18	6	3
19.1	11.89	18.0	45.25	79.4	31.59	98.4	39.66	37.3
29.1	11.85 <sup>4</sup>	18.3 <sup>3</sup>	45.12 <sup>13</sup>	77.4 <sup>20</sup>	31.42 <sup>17</sup>	96.2 <sup>22</sup>	39.62 <sup>4</sup>	37.5 <sup>2</sup>
Aug. 8.1	11.83 <sup>2</sup>	18.6 <sup>3</sup>	45.04 <sup>8</sup>	75.1 <sup>23</sup>	31.30 <sup>12</sup>	93.7 <sup>25</sup>	39.60 <sup>2</sup>	37.6 <sup>1</sup>
	1	2	4	26	6	28	0	1
18.1	11.84	18.8	45.00	72.5	31.24	90.9	39.60	37.5
28.0	11.87 <sup>3</sup>	18.8 <sup>0</sup>	45.02 <sup>2</sup>	69.7 <sup>28</sup>	31.24 <sup>0</sup>	87.8 <sup>31</sup>	39.63 <sup>3</sup>	37.3 <sup>2</sup>
	6	2	6	30	6	32	5	4
Sept. 7.0	11.93	18.6	45.08	66.7	31.30	84.6	39.68	36.9
17.0	12.02 <sup>9</sup>	18.2 <sup>4</sup>	45.20 <sup>12</sup>	63.5 <sup>32</sup>	31.43 <sup>13</sup>	81.3 <sup>33</sup>	39.77 <sup>9</sup>	36.3 <sup>6</sup>
26.9	12.14 <sup>12</sup>	17.6 <sup>6</sup>	45.38 <sup>18</sup>	60.3 <sup>32</sup>	31.62 <sup>19</sup>	77.9 <sup>34</sup>	39.89 <sup>12</sup>	35.4 <sup>9</sup>
Oct. 6.9	12.30 <sup>16</sup>	16.7 <sup>9</sup>	45.61 <sup>23</sup>	57.1 <sup>32</sup>	31.88 <sup>26</sup>	74.5 <sup>34</sup>	40.04 <sup>15</sup>	34.4 <sup>10</sup>
16.9	12.49 <sup>19</sup>	15.6 <sup>11</sup>	45.91 <sup>30</sup>	53.9 <sup>32</sup>	32.21 <sup>33</sup>	71.2 <sup>33</sup>	40.23 <sup>19</sup>	33.1 <sup>13</sup>
	24	14	35	31	40	31	23	16
26.9	12.73	14.2	46.26	50.8	32.61	68.1	40.46	31.5
Nov. 5.8	12.99 <sup>26</sup>	12.5 <sup>17</sup>	46.67 <sup>41</sup>	47.9 <sup>29</sup>	33.06 <sup>45</sup>	65.1 <sup>30</sup>	40.72 <sup>26</sup>	29.7 <sup>18</sup>
	26	18	45	26	51	26	29	19
15.8	13.28 <sup>29</sup>	10.7 <sup>18</sup>	47.12 <sup>45</sup>	45.3 <sup>26</sup>	33.57 <sup>51</sup>	62.5 <sup>26</sup>	41.01 <sup>29</sup>	27.8 <sup>19</sup>
25.8	13.60 <sup>32</sup>	8.7 <sup>20</sup>	47.61 <sup>49</sup>	43.0 <sup>23</sup>	34.13 <sup>56</sup>	60.3 <sup>22</sup>	41.33 <sup>32</sup>	25.7 <sup>21</sup>
Dec. 5.8	13.94 <sup>34</sup>	6.6 <sup>21</sup>	48.13 <sup>52</sup>	41.2 <sup>18</sup>	34.71 <sup>58</sup>	58.5 <sup>18</sup>	41.67 <sup>34</sup>	23.6 <sup>21</sup>
	34	22	53	14	60	13	34	22
15.7	14.28	4.4	48.66	39.8	35.31	57.2	42.01	21.4
25.7	14.61 <sup>33</sup>	2.3 <sup>21</sup>	49.18 <sup>52</sup>	38.9 <sup>9</sup>	35.91 <sup>60</sup>	56.4 <sup>8</sup>	42.35 <sup>34</sup>	19.3 <sup>21</sup>
35.7	14.93 <sup>32</sup>	0.2 <sup>21</sup>	49.69 <sup>51</sup>	38.6 <sup>3</sup>	36.49 <sup>58</sup>	56.3 <sup>1</sup>	42.67 <sup>32</sup>	17.4 <sup>19</sup>
Sec δ, Tan δ	1.003	+0.071	1.828	+1.530	2.145	+1.897	1.009	+0.137
Mean Place	10 <sup>s</sup> .282	26 <sup>''</sup> .68	43 <sup>s</sup> .315	77 <sup>''</sup> .88	29 <sup>s</sup> .677	96 <sup>''</sup> .50	38 <sup>s</sup> .013	45 <sup>''</sup> .22
D'ψ <i>α</i> , D <i>ωα</i>	0.00	0.00	+0.01	+0.10	+0.01	+0.12	0.00	+0.01
Dψδ, D <i>ωδ</i>	-0.4	+0.3	-0.4	+0.3	-0.4	+0.3	-0.4	+0.3

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	<i>p</i> <sup>4</sup> Leonis. Mag. 5.7		<i>ψ</i> Ursæ Majoris. Mag. 3.2		<i>β</i> Crateris. Mag. 4.5		<i>δ</i> Leonis. Mag. 2.6	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 11 2	° ' + 2 24	h m 11 4	° ' + 44 56	h m 11 7	° ' − 22 21	h m 11 9	° ' + 20 58
	s	"	s	"	s	"	s	"
Jan. 0.7	35.25	58.4	55.31	79.8	29.43	38.1	36.73	72.4
10.7	35.56 <sup>31</sup>	56.3 <sup>21</sup>	55.71 <sup>40</sup>	79.2 <sup>6</sup>	29.75 <sup>32</sup>	40.8 <sup>27</sup>	37.07 <sup>34</sup>	70.9 <sup>15</sup>
20.6	35.84 <sup>28</sup>	54.4 <sup>19</sup>	56.08 <sup>37</sup>	79.2 <sup>0</sup>	30.04 <sup>29</sup>	43.5 <sup>27</sup>	37.37 <sup>30</sup>	69.8 <sup>11</sup>
30.6	36.08 <sup>24</sup>	52.8 <sup>16</sup>	56.40 <sup>32</sup>	79.6 <sup>4</sup>	30.29 <sup>25</sup>	46.2 <sup>27</sup>	37.63 <sup>26</sup>	69.0 <sup>8</sup>
Feb. 9.6	36.28 <sup>20</sup>	51.4 <sup>14</sup>	56.67 <sup>27</sup>	80.5 <sup>9</sup>	30.49 <sup>20</sup>	48.9 <sup>27</sup>	37.86 <sup>23</sup>	68.6 <sup>4</sup>
	15	12	20	13	16	25	17	1
19.5	36.43	50.2	56.87	81.8	30.65	51.4	38.03	68.5
Mar. 1.5	36.54 <sup>11</sup>	49.3 <sup>9</sup>	57.01 <sup>14</sup>	83.4 <sup>16</sup>	30.76 <sup>11</sup>	53.7 <sup>23</sup>	38.15 <sup>12</sup>	68.7 <sup>2</sup>
11.5	36.61 <sup>7</sup>	48.7 <sup>6</sup>	57.09 <sup>8</sup>	85.2 <sup>18</sup>	30.83 <sup>7</sup>	55.8 <sup>21</sup>	38.23 <sup>8</sup>	69.2 <sup>5</sup>
21.5	36.63 <sup>2</sup>	48.3 <sup>4</sup>	57.11 <sup>2</sup>	87.2 <sup>20</sup>	30.85 <sup>2</sup>	57.7 <sup>19</sup>	38.26 <sup>3</sup>	70.0 <sup>8</sup>
31.4	36.62 <sup>1</sup>	48.1 <sup>2</sup>	57.07 <sup>4</sup>	89.2 <sup>20</sup>	30.84 <sup>1</sup>	59.2 <sup>15</sup>	38.25 <sup>1</sup>	70.8 <sup>8</sup>
	5	0	9	19	4	13	4	10
Apr. 10.4	36.57	48.1	56.98	91.1	30.80	60.5	38.21	71.8
20.4	36.51 <sup>6</sup>	48.3 <sup>2</sup>	56.85 <sup>13</sup>	93.0 <sup>19</sup>	30.73 <sup>7</sup>	61.6 <sup>11</sup>	38.14 <sup>7</sup>	72.9 <sup>11</sup>
30.4	36.43 <sup>8</sup>	48.6 <sup>3</sup>	56.70 <sup>15</sup>	94.6 <sup>16</sup>	30.64 <sup>9</sup>	62.3 <sup>7</sup>	38.05 <sup>9</sup>	73.9 <sup>10</sup>
May 10.3	36.33 <sup>10</sup>	49.0 <sup>4</sup>	56.53 <sup>17</sup>	96.0 <sup>14</sup>	30.53 <sup>11</sup>	62.8 <sup>5</sup>	37.94 <sup>11</sup>	74.8 <sup>9</sup>
20.3	36.23 <sup>10</sup>	49.5 <sup>5</sup>	56.35 <sup>18</sup>	97.0 <sup>10</sup>	30.42 <sup>11</sup>	63.0 <sup>2</sup>	37.83 <sup>11</sup>	75.7 <sup>9</sup>
	10	5	19	7	11	1	11	7
30.3	36.13	50.0	56.16	97.7	30.31	62.9	37.72	76.4
June 9.2	36.03 <sup>10</sup>	50.6 <sup>6</sup>	55.97 <sup>19</sup>	98.1 <sup>4</sup>	30.19 <sup>12</sup>	62.5 <sup>4</sup>	37.61 <sup>11</sup>	77.0 <sup>6</sup>
19.2	35.94 <sup>9</sup>	51.2 <sup>6</sup>	55.80 <sup>17</sup>	98.1 <sup>0</sup>	30.08 <sup>11</sup>	61.9 <sup>6</sup>	37.50 <sup>11</sup>	77.4 <sup>4</sup>
29.2	35.86 <sup>8</sup>	51.8 <sup>6</sup>	55.64 <sup>16</sup>	97.7 <sup>4</sup>	29.97 <sup>11</sup>	61.1 <sup>8</sup>	37.40 <sup>10</sup>	77.6 <sup>2</sup>
July 9.2	35.78 <sup>8</sup>	52.3 <sup>5</sup>	55.51 <sup>13</sup>	96.9 <sup>8</sup>	29.88 <sup>9</sup>	60.1 <sup>10</sup>	37.32 <sup>8</sup>	77.7 <sup>1</sup>
	6	5	12	11	8	12	7	2
19.1	35.72	52.8	55.39	95.8	29.80	58.9	37.25	77.5
29.1	35.68 <sup>4</sup>	53.2 <sup>4</sup>	55.31 <sup>8</sup>	94.4 <sup>14</sup>	29.73 <sup>7</sup>	57.6 <sup>13</sup>	37.20 <sup>5</sup>	77.1 <sup>4</sup>
Aug. 8.1	35.66 <sup>2</sup>	53.6 <sup>4</sup>	55.25 <sup>6</sup>	92.6 <sup>18</sup>	29.69 <sup>4</sup>	56.2 <sup>14</sup>	37.17 <sup>3</sup>	76.6 <sup>5</sup>
18.1	35.66 <sup>0</sup>	53.8 <sup>2</sup>	55.22 <sup>3</sup>	90.6 <sup>20</sup>	29.67 <sup>2</sup>	54.7 <sup>15</sup>	37.16 <sup>1</sup>	75.8 <sup>8</sup>
28.0	35.68 <sup>2</sup>	53.9 <sup>1</sup>	55.23 <sup>1</sup>	88.3 <sup>23</sup>	29.68 <sup>1</sup>	53.3 <sup>14</sup>	37.18 <sup>2</sup>	74.8 <sup>10</sup>
	5	1	6	25	4	13	4	12
Sept. 7.0	35.73	53.8	55.29	85.8	29.72	52.0	37.22	73.6
17.0	35.81 <sup>8</sup>	53.5 <sup>3</sup>	55.38 <sup>9</sup>	83.1 <sup>27</sup>	29.79 <sup>7</sup>	50.9 <sup>11</sup>	37.30 <sup>8</sup>	72.2 <sup>14</sup>
26.9	35.93 <sup>12</sup>	53.0 <sup>5</sup>	55.52 <sup>14</sup>	80.3 <sup>28</sup>	29.91 <sup>12</sup>	50.0 <sup>9</sup>	37.42 <sup>12</sup>	70.6 <sup>16</sup>
Oct. 6.9	36.08 <sup>15</sup>	52.2 <sup>8</sup>	55.71 <sup>19</sup>	77.4 <sup>29</sup>	30.06 <sup>15</sup>	49.4 <sup>6</sup>	37.57 <sup>15</sup>	68.8 <sup>18</sup>
16.9	36.27 <sup>19</sup>	51.2 <sup>10</sup>	55.94 <sup>23</sup>	74.5 <sup>29</sup>	30.26 <sup>20</sup>	49.1 <sup>3</sup>	37.76 <sup>19</sup>	66.8 <sup>20</sup>
	23	13	28	29	24	1	23	21
26.9	36.50	49.9	56.22	71.6	30.50	49.2	37.99	64.7
Nov. 5.8	36.76 <sup>26</sup>	48.3 <sup>16</sup>	56.55 <sup>33</sup>	68.8 <sup>28</sup>	30.77 <sup>27</sup>	49.7 <sup>5</sup>	38.26 <sup>27</sup>	62.4 <sup>23</sup>
15.8	37.05 <sup>29</sup>	46.5 <sup>18</sup>	56.91 <sup>36</sup>	66.2 <sup>26</sup>	31.08 <sup>31</sup>	50.7 <sup>10</sup>	38.56 <sup>30</sup>	60.1 <sup>23</sup>
25.8	37.36 <sup>31</sup>	44.5 <sup>20</sup>	57.31 <sup>40</sup>	63.8 <sup>24</sup>	31.41 <sup>33</sup>	52.1 <sup>14</sup>	38.88 <sup>32</sup>	57.8 <sup>23</sup>
Dec. 5.8	37.69 <sup>33</sup>	42.4 <sup>21</sup>	57.73 <sup>42</sup>	61.7 <sup>21</sup>	31.76 <sup>35</sup>	53.9 <sup>18</sup>	39.23 <sup>35</sup>	55.6 <sup>22</sup>
	34	22	43	17	36	20	35	21
15.7	38.03	40.2	58.16	60.0	32.12	55.9	39.58	53.5
25.7	38.37 <sup>34</sup>	38.0 <sup>22</sup>	58.59 <sup>43</sup>	58.7 <sup>13</sup>	32.47 <sup>35</sup>	58.3 <sup>24</sup>	39.94 <sup>36</sup>	51.6 <sup>19</sup>
35.7	38.69 <sup>32</sup>	35.9 <sup>21</sup>	59.01 <sup>42</sup>	57.8 <sup>9</sup>	32.81 <sup>34</sup>	60.9 <sup>26</sup>	40.28 <sup>34</sup>	50.0 <sup>16</sup>
Sec <i>δ</i> , Tan <i>δ</i>	1.001	+0.042	1.413	+0.998	1.081	−0.411	1.071	+0.384
Mean Place	34 <sup>h</sup> .123	62 <sup>m</sup> .26	53 <sup>h</sup> .468	95 <sup>m</sup> .81	28 <sup>h</sup> .530	42 <sup>m</sup> .15	35 <sup>h</sup> .433	82 <sup>m</sup> .42
<i>D</i> ' <i>α</i> , <i>D</i> <sub>α</sub> <i>α</i>	0.00	0.00	+0.01	+0.06	0.00	−0.03	0.00	+0.02
<i>D</i> ' <i>δ</i> , <i>D</i> <sub>δ</sub> <i>δ</i>	−0.4	+0.2	−0.4	+0.2	−0.4	+0.2	−0.4	+0.2



FOR THE UPPER TRANSIT AT WASHINGTON.

Star	π Centauri. Mag. 4.3		ι Leonis. Mag. 4.0		τ Leonis. Mag. 5.2		λ Draconis. Mag. 4.1	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 11 17 s	° ' -54 1 "	h m 11 19 s	° ' +10 59 "	h m 11 23 s	° ' + 3 19 "	h m 11 26 s	° ' +69 47 "
1.7	8.17	17.7	30.75	44.0	35.00	23.3	25.59	40.0
1.7	8.60 43	20.5 28	31.07 32	42.1 19	35.32 32	21.3 20	26.33 74	40.1 1
1.6	8.99 39	23.6 31	31.37 30	40.5 16	35.61 29	19.4 19	27.01 68	40.8 7
1.6	9.33 34	27.0 34	31.63 26	39.2 13	35.87 26	17.7 17	27.61 60	42.0 12
1.6	9.61 28	30.6 36	31.85 22	38.2 10	36.09 22	16.3 14	28.12 51	43.8 18
	20	36	18	7	18	11	39	22
1.6	9.81	34.2	32.03	37.5	36.27	15.2	28.51	46.0
1.5	9.95 14	37.8 36	32.16 13	37.2 3	36.40 13	14.3 9	28.78 27	48.5 25
1.5	10.03 8	41.3 35	32.24 8	37.1 1	36.48 8	13.7 6	28.93 15	51.3 28
1.5	10.04 1	44.6 33	32.29 5	37.2 1	36.53 5	13.4 3	28.96 3	54.1 28
1.4	10.00 4	47.7 31	32.29 0	37.5 3	36.54 1	13.3 1	28.86 10	56.9 28
	9	28	3	5	2	1	20	27
1.4	9.91	50.5	32.26	38.0	36.52	13.4	28.66	59.6
1.4	9.77 14	53.0 25	32.21 5	38.6 6	36.47 5	13.6 2	28.37 29	62.1 25
1.4	9.60 17	55.1 21	32.13 8	39.3 7	36.40 7	14.0 4	28.00 37	64.2 21
1.3	9.41 19	56.8 17	32.04 9	40.0 7	36.32 8	14.5 5	27.57 43	65.9 17
1.3	9.19 22	58.1 13	31.94 10	40.7 7	36.23 9	15.0 5	27.10 47	67.1 12
	24	7	10	7	10	6	49	7
1.3	8.95	58.8	31.84	41.4	36.13	15.6	26.61	67.8
1.3	8.71 24	59.1 3	31.74 10	42.0 6	36.03 10	16.2 6	26.11 50	68.0 2
1.2	8.47 24	59.0 1	31.65 9	42.6 6	35.94 9	16.7 5	25.62 49	67.7 3
1.2	8.23 24	58.4 6	31.56 9	43.0 4	35.85 9	17.3 6	25.16 46	66.9 8
1.2	8.00 23	57.3 11	31.48 8	43.3 3	35.77 8	17.8 5	24.73 43	65.6 13
	20	15	7	3	7	5	38	18
1.1	7.80	55.8	31.41	43.6	35.70	18.3	24.35	63.8
1.1	7.62 18	54.0 18	31.35 6	43.7 1	35.65 5	18.7 4	24.03 32	61.5 23
1.1	7.47 15	51.8 22	31.32 3	43.6 1	35.61 4	19.0 3	23.77 26	58.9 26
1.1	7.37 10	49.4 24	31.30 2	43.4 2	35.59 2	19.2 2	23.58 19	56.0 29
1.0	7.31 6	46.9 25	31.31 1	42.9 5	35.59 0	19.2 0	23.47 11	52.8 32
	0	25	4	6	3	2	3	35
1.0	7.31	44.4	31.35	42.3	35.62	19.0	23.44	49.3
1.0	7.37 6	41.9 25	31.42 7	41.5 8	35.68 6	18.7 3	23.50 6	45.8 35
1.0	7.50 13	39.5 24	31.52 10	40.5 10	35.78 10	18.1 6	23.65 15	42.1 37
1.9	7.69 19	37.3 22	31.66 14	39.2 13	35.91 13	17.2 9	23.89 24	38.4 37
1.9	7.95 26	35.6 17	31.83 17	37.7 15	36.09 18	16.1 11	24.23 34	34.8 36
	32	14	22	17	21	13	43	34
1.9	8.27	34.2	32.05	36.0	36.30	14.8	24.66	31.4
1.8	8.65 38	33.4 8	32.30 25	34.1 19	36.54 24	13.2 16	25.18 52	28.2 32
1.8	9.08 43	33.2 2	32.58 28	32.0 21	36.82 28	11.4 18	25.77 59	25.3 29
1.8	9.55 47	33.5 3	32.89 31	29.8 22	37.13 31	9.4 20	26.44 67	22.8 25
1.8	10.04 49	34.4 9	33.23 34	27.6 22	37.46 33	7.2 22	27.16 72	20.8 20
	49	15	34	22	34	22	75	15
1.7	10.53	35.9	33.57	25.4	37.80	5.0	27.91	19.3
1.7	11.01 48	38.0 21	33.91 34	23.3 21	38.14 34	2.8 22	28.68 77	18.4 9
1.7	11.48 47	40.5 25	34.25 34	21.4 19	38.46 32	0.7 21	29.43 75	18.1 3
Δ δ	1.702	-1.377	1.019	+0.194	1.002	+0.058	2.895	+2.717
ce	7°.546	30''.24	29°.634	51''.30	33°.984	28''.29	22°.439	61''.25
a	-0.01	-0.09	0.00	+0.01	0.00	0.00	+0.01	+0.18
δ	-0.4	+0.2	-0.4	+0.2	-0.4	+0.2	-0.4	+0.1

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ξ Hydræ. Mag. 3.7		λ Centauri. Mag. 3.3		υ Leonis. Mag. 4.5		π Chamæleontis. Mag. 5.7	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 11 28 s	° ' " — 31 23 " "	h m 11 31 s	° ' " — 62 32 " "	h m 11 32 s	° ' " — 0 21 " "	h m 11 33 s	° ' " — 75 25 " "
Jan. 0.7	49.82	7.8	51.53	44.0	36.73	19.6	44.87	17.7
10.7	50.17 35	10.5 27	52.07 54	46.6 26	37.05 32	21.8 22	45.77 90	20.0 23
20.6	50.49 32	13.3 28	52.56 49	49.6 30	37.35 30	23.8 20	46.58 81	22.9 29
30.6	50.77 28	16.2 29	52.99 43	52.9 33	37.61 26	25.6 18	47.27 69	26.2 33
Feb. 9.6	51.00 23 19	19.1 29 29	53.34 35 27	56.4 35 37	37.84 23 18	27.2 16 14	47.84 57 44	29.7 55 38
19.6	51.19	22.0	53.61	60.1	38.02	28.6	48.28	33.5
Mar. 1.5	51.33 14	24.8 28	53.80 19	63.9 38	38.16 14	29.7 11	48.57 29	37.4 39
11.5	51.42 9	27.4 26	53.92 12	67.6 37	38.26 10	30.5 8	48.72 15	41.3 39
21.5	51.46 4	29.7 23	53.95 3	71.2 36	38.31 5	31.1 6	48.74 2	45.2 39
31.5	51.47 1 3	31.8 21 19	53.91 4 10	74.7 35 32	38.33 2 2	31.4 3 1	48.62 12 23	48.9 37 36
Apr. 10.4	51.44	33.7	53.81	77.9	38.31	31.5	48.39	52.5
20.4	51.38 6	35.2 15	53.65 16	80.7 28	38.27 4	31.4 1	48.05 34	55.7 32
30.4	51.30 8	36.4 12	53.44 21	83.2 25	38.21 6	31.2 2	47.61 44	58.6 29
May 10.3	51.20 10	37.3 9	53.19 25	85.3 21	38.14 7	30.9 3	47.08 53	61.1 25
20.3	51.08 12 12	37.9 6 3	52.91 28 31	87.0 17 11	38.05 9 9	30.5 4 6	46.49 59 65	63.1 20 16
30.3	50.96	38.2	52.60	88.1	37.96	29.9	45.84	64.7
June 9.3	50.83 13	38.1 1	52.27 33	88.8 7	37.87 9	29.4 5	45.15 69	65.7 10
19.2	50.70 13	37.7 4	51.94 33	89.0 2	37.77 10	28.8 6	44.44 71	66.2 5
29.2	50.57 13	37.0 7	51.60 34	88.7 3	37.68 9	28.2 6	43.72 72	66.1 1
July 9.2	50.45 12 11	36.0 10 12	51.27 33 30	87.9 8 13	37.60 8 8	27.6 6 6	43.03 69 66	65.5 6 11
19.2	50.34	34.8	50.97	86.6	37.52	27.0	42.37	64.4
29.1	50.25 9	33.4 14	50.69 28	84.8 18	37.46 6	26.5 5	41.77 60	62.8 16
Aug. 8.1	50.17 8	31.8 16	50.46 23	82.8 20	37.41 5	26.0 5	41.26 51	60.7 21
18.1	50.12 5	30.1 17	50.28 18	80.4 24	37.39 2	25.7 3	40.84 42	58.3 24
28.0	50.10 2 1	28.3 18 17	50.16 12 5	77.8 26 27	37.38 1 2	25.4 3 0	40.55 29 16	55.6 27 29
Sept. 7.0	50.11	26.6	50.11	75.1	37.40	25.4	40.39	52.7
17.0	50.16 5	25.0 16	50.14 3	72.3 28	37.46 6	25.5 1	40.38 1	49.7 30
27.0	50.26 10	23.6 14	50.25 11	69.6 27	37.55 9	25.9 4	40.53 15	46.8 29
Oct. 6.9	50.40 14	22.5 11	50.45 20	67.1 25	37.67 12	26.5 6	40.83 30	44.0 28
16.9	50.58 18 24	21.7 8 4	50.74 29 37	65.0 21 18	37.83 16 21	27.4 9 12	41.30 47 62	41.5 25 22
26.9	50.82	21.3	51.11	63.2	38.04	28.6	41.92	39.3
Nov. 5.9	51.10 28	21.3 0	51.56 45	62.0 12	38.28 24	30.0 14	42.66 74	37.7 16
15.8	51.41 31	21.8 5	52.07 51	61.2 8	38.55 27	31.7 17	43.52 86	36.5 12
25.8	51.75 34	22.8 10	52.63 56	61.1 1	38.85 30	33.6 19	44.46 94	36.0 5
Dec. 5.8	52.12 37 38	24.2 14 18	53.22 59 60	61.6 5 12	39.18 33 34	35.7 21 22	45.45 99 100	36.2 2 8
15.7	52.50	26.0	53.82	62.8	39.52	37.9	46.45	37.0
25.7	52.87 37	28.2 22	54.41 59	64.5 17	39.86 34	40.1 22	47.44 99	38.4 14
35.7	53.23 36	30.7 25	54.98 57	66.8 23	40.19 33	42.3 22	48.39 95	40.4 20
Sec δ, Tan δ	1.172	—0.610	2.169	—1.925	1.000	—0.006	3.975	—3.847
Mean Place	49°.112	14''.19	51°.141	58''.03	35°.798	15''.61	44°.826	33''.58
D'ψ α, Dω α	0.00	—0.04	—0.01	—0.13	0.00	0.00	—0.01	—0.25
Dψ δ, Dω δ	—0.4	+0.1	—0.4	+0.1	—0.4	+0.1	—0.4	+0.1

[Eph 1c]

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	3 Draconis. Mag. 5.5		ζ Crateris. Mag. 4.9		χ Ursæ Majoris. Mag. 3.8		β Leonis. (Denebola.) Mag. 2.2	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 11 37 s	° ' " +67 12 "	h m 11 40 s	° ' " -17 52 "	h m 11 41 s	° ' " +48 14 "	h m 11 44 s	° ' " +15 2 "
Jan. 0.7	47.31	33.8	27.89	39.5	35.70	43.9	44.54	40.5
10.7	47.98 67	33.6 2	28.23 34	42.0 25	36.14 44	43.1 8	44.87 33	38.7 18
20.7	48.61 63	34.1 5	28.54 31	44.5 25	36.55 41	42.8 3	45.19 32	37.2 15
30.6	49.18 57	35.2 11	28.81 27	47.0 25	36.92 37	43.1 3	45.47 28	36.0 12
Feb. 9.6	49.66 48 38	36.8 16 20	29.05 24 19	49.3 23 23	37.24 32 26	43.9 8 13	45.71 24 20	35.1 9 5
19.6	50.04 28	38.8	29.24 14	51.6	37.50 19	45.2 16	45.91 16	34.6 2
Mar. 1.5	50.32 16	41.2 24	29.38 11	53.7 18	37.69 13	46.8 19	46.07 11	34.4 1
11.5	50.48 5	43.9 27	29.49 6	55.5 16	37.82 6	48.7 22	46.18 6	34.5 4
21.5	50.53 5	46.7 28	29.55 3	57.1 14	37.88 1	50.9 22	46.24 3	34.9 6
31.5	50.48 15	49.5 27	29.58 1	58.5 11	37.89 5	53.1 23	46.27 1	35.5 7
Apr. 10.4	50.33 23	52.2 25	29.57 4	59.6 9	37.84 10	55.4 21	46.26 4	36.2 9
20.4	50.10 30	54.7 22	29.53 6	60.5 6	37.74 14	57.5 20	46.22 6	37.1 9
30.4	49.80 36	56.9 18	29.47 7	61.1 4	37.60 16	59.5 17	46.16 7	38.0 9
May 10.4	49.44 40	58.7 14	29.40 9	61.5 2	37.44 19	61.2 14	46.09 9	38.9 9
20.3	49.04 42	60.1 9	29.31 10	61.7 1	37.25 20	62.6 11	46.00 10	39.8 8
30.3	48.62 43	61.0 4	29.21 10	61.6 3	37.05 20	63.7 7	45.90 10	40.6 8
June 9.3	48.19 43	61.4 1	29.11 10	61.3 4	36.85 20	64.4 3	45.80 11	41.4 6
19.2	47.76 41	61.3 7	29.01 10	60.9 7	36.65 19	64.7 2	45.69 10	42.0 4
29.2	47.35 38	60.6 11	28.91 10	60.2 8	36.46 18	64.5 5	45.59 9	42.4 3
July 9.2	46.97 35	59.5 16	28.81 9	59.4 10	36.28 17	64.0 10	45.50 9	42.7 2
19.2	46.62 30	57.9 20	28.72 8	58.4 10	36.11 14	63.0 13	45.41 7	42.9 1
29.1	46.32 25	55.9 25	28.64 6	57.4 11	35.97 11	61.7 17	45.34 6	42.8 2
Aug. 8.1	46.07 19	53.4 28	28.58 4	56.3 12	35.86 8	60.0 20	45.28 4	42.6 4
18.1	45.88 12	50.6 31	28.54 2	55.1 11	35.78 5	58.0 24	45.24 2	42.2 6
28.1	45.76 5	47.5 33	28.52 1	54.0 10	35.73 1	55.6 26	45.22 1	41.6 9
Sept. 7.0	45.71 3	44.2 35	28.53 4	53.0 9	35.72 4	53.0 28	45.23 4	40.7 10
17.0	45.74 11	40.7 36	28.57 8	52.1 7	35.76 8	50.2 30	45.27 8	39.7 13
27.0	45.85 19	37.1 36	28.65 12	51.4 4	35.84 13	47.2 31	45.35 11	38.4 16
Oct. 6.9	46.04 28	33.5 37	28.77 16	51.0 1	35.97 19	44.1 32	45.46 15	36.8 17
16.9	46.32 36	29.8 35	28.93 21	50.9 3	36.16 24	40.9 32	45.61 19	35.1 20
26.9	46.68 44	26.3 33	29.14 25	51.2 6	36.40 29	37.7 31	45.80 23	33.1 21
Nov. 5.9	47.12 52	23.0 30	29.39 28	51.8 9	36.69 35	34.6 30	46.03 27	31.0 22
15.8	47.64 59	20.0 26	29.67 31	52.7 14	37.04 38	31.6 27	46.30 30	28.8 23
25.8	48.23 64	17.4 22	29.98 34	54.1 17	37.42 42	28.9 24	46.60 33	26.5 23
Dec. 5.8	48.87 68	15.2 17	30.32 35	55.8 19	37.84 44	26.5 21	46.93 34	24.2 23
15.8	49.55 69	13.5 12	30.67 35	57.7 22	38.28 45	24.4 16	47.27 35	21.9 21
25.7	50.24 68	12.3 5	31.02 35	59.9 24	38.73 45	22.8 11	47.62 34	19.8 20
35.7	50.92	11.8	31.37	62.3	39.18	21.7	47.96	17.8
Sec δ, Tan δ	2.582	+2.380	1.051	-0.323	1.502	+1.120	1.035	+0.269
Mean Place	44°.648	55''.43	27°.154	41''.26	34°.089	62''.66	43°.528	50''.16
D <sub>☉</sub> α, D <sub>☉</sub> δ	+0.01	+0.16	0.00	-0.02	0.00	+0.07	0.00	+0.02
D <sub>☉</sub> δ, D <sub>☉</sub> δ	-0.4	+0.1	-0.4	+0.1	-0.4	+0.1	-0.4	+0.1

FOR THE UPPER TRANSIT AT  $\square$  $\square$ .

M

J<sub>2</sub>F<sub>0</sub>

M

A

M

J<sub>1</sub>J<sub>1</sub>

A

S<sub>0</sub>O<sub>0</sub>

N

D

Sec  
Me.D'<sub>1</sub>  
D<sub>2</sub>



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♍ Virginis. Mag. 4.2		♋ Centauri. Mag. 2.9		♌ Corvi. Mag. 3.2		♉ H. Draconis. Mag. 5.1	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 12 0 s	° ' " + 9 11 "	h m 12 3 s	° ' " - 50 14 "	h m 12 5 s	° ' " - 22 8 "	h m 12 8 s	° ' " + 78 4 "
Jan. 0.7	53.64	69.7	57.07	46.2	45.60	47.0	17.60	54.7
10.7	53.98 <sup>34</sup>	67.7 <sup>20</sup>	57.52 <sup>45</sup>	48.5 <sup>23</sup>	45.95 <sup>35</sup>	49.4 <sup>24</sup>	18.77 <sup>117</sup>	54.5 <sup>2</sup>
20.7	54.29 <sup>31</sup>	65.9 <sup>18</sup>	57.94 <sup>42</sup>	51.2 <sup>27</sup>	46.28 <sup>33</sup>	51.9 <sup>25</sup>	19.90 <sup>113</sup>	54.9 <sup>4</sup>
30.6	54.58 <sup>29</sup>	64.4 <sup>15</sup>	58.32 <sup>38</sup>	54.2 <sup>30</sup>	46.58 <sup>30</sup>	54.4 <sup>25</sup>	20.94 <sup>104</sup>	55.9 <sup>10</sup>
Feb. 9.6	54.83 <sup>25</sup> <sup>21</sup>	63.3 <sup>11</sup> <sup>9</sup>	58.65 <sup>33</sup> <sup>27</sup>	57.4 <sup>32</sup> <sup>33</sup>	46.84 <sup>26</sup> <sup>22</sup>	56.9 <sup>25</sup> <sup>24</sup>	21.85 <sup>91</sup> <sup>76</sup>	57.6 <sup>17</sup> <sup>21</sup>
19.6	55.04	62.4	58.92	60.7	47.06	59.3	22.61	59.7
Mar. 1.6	55.21 <sup>17</sup>	61.9 <sup>5</sup>	59.14 <sup>22</sup>	64.1 <sup>34</sup>	47.23 <sup>17</sup>	61.5 <sup>22</sup>	23.19 <sup>58</sup>	62.2 <sup>25</sup>
11.5	55.34 <sup>13</sup> <sup>8</sup>	61.6 <sup>3</sup> <sup>0</sup>	59.29 <sup>15</sup> <sup>10</sup>	67.4 <sup>33</sup> <sup>32</sup>	47.36 <sup>13</sup> <sup>9</sup>	63.6 <sup>21</sup> <sup>19</sup>	23.57 <sup>38</sup> <sup>17</sup>	65.0 <sup>28</sup> <sup>30</sup>
21.5	55.42 <sup>8</sup>	61.6 <sup>0</sup>	59.39 <sup>10</sup>	70.6 <sup>32</sup>	47.45 <sup>9</sup>	65.5 <sup>19</sup>	23.74 <sup>17</sup>	68.0 <sup>30</sup>
31.5	55.46 <sup>4</sup> <sup>2</sup>	61.9 <sup>3</sup> <sup>4</sup>	59.44 <sup>5</sup> <sup>0</sup>	73.6 <sup>30</sup> <sup>29</sup>	47.51 <sup>6</sup> <sup>2</sup>	67.1 <sup>16</sup> <sup>14</sup>	23.72 <sup>2</sup> <sup>22</sup>	71.0 <sup>30</sup> <sup>30</sup>
Apr. 10.5	55.48	62.3	59.44	76.5	47.53	68.5	23.50	74.0
20.4	55.46 <sup>2</sup>	62.9 <sup>6</sup>	59.39 <sup>5</sup>	79.0 <sup>25</sup>	47.52 <sup>1</sup>	69.6 <sup>11</sup>	23.11 <sup>39</sup>	76.8 <sup>28</sup>
30.4	55.41 <sup>5</sup>	63.6 <sup>7</sup>	59.31 <sup>8</sup>	81.2 <sup>22</sup>	47.48 <sup>4</sup>	70.5 <sup>9</sup>	22.57 <sup>54</sup>	79.3 <sup>25</sup>
May 10.4	55.35 <sup>6</sup>	64.4 <sup>8</sup>	59.19 <sup>12</sup>	83.1 <sup>19</sup>	47.42 <sup>6</sup>	71.1 <sup>6</sup>	21.89 <sup>68</sup>	81.4 <sup>21</sup>
20.3	55.28 <sup>7</sup> <sup>9</sup>	65.2 <sup>8</sup> <sup>7</sup>	59.05 <sup>14</sup> <sup>17</sup>	84.7 <sup>16</sup> <sup>11</sup>	47.34 <sup>8</sup> <sup>8</sup>	71.5 <sup>4</sup> <sup>2</sup>	21.11 <sup>78</sup> <sup>85</sup>	83.0 <sup>16</sup> <sup>12</sup>
30.3	55.19	65.9	58.88	85.8	47.26	71.7	20.26	84.2
June 9.3	55.10 <sup>9</sup>	66.6 <sup>7</sup>	58.70 <sup>18</sup>	86.4 <sup>6</sup>	47.16 <sup>10</sup>	71.6 <sup>1</sup>	19.36 <sup>90</sup>	84.8 <sup>6</sup>
19.3	55.00 <sup>10</sup>	67.3 <sup>7</sup>	58.50 <sup>20</sup>	86.7 <sup>3</sup>	47.05 <sup>11</sup>	71.3 <sup>3</sup>	18.44 <sup>92</sup>	84.8 <sup>0</sup>
29.2	54.90 <sup>10</sup>	67.9 <sup>6</sup>	58.29 <sup>21</sup>	86.5 <sup>2</sup>	46.95 <sup>10</sup>	70.8 <sup>5</sup>	17.53 <sup>91</sup>	84.3 <sup>5</sup>
July 9.2	54.81 <sup>9</sup> <sup>9</sup>	68.3 <sup>4</sup> <sup>4</sup>	58.08 <sup>21</sup> <sup>20</sup>	85.9 <sup>6</sup> <sup>10</sup>	46.84 <sup>11</sup> <sup>11</sup>	70.0 <sup>8</sup> <sup>9</sup>	16.65 <sup>88</sup> <sup>83</sup>	83.3 <sup>10</sup> <sup>15</sup>
19.2	54.72 <sup>8</sup>	68.7 <sup>2</sup>	57.88 <sup>18</sup>	84.9 <sup>14</sup>	46.73 <sup>9</sup>	69.1 <sup>10</sup>	15.82 <sup>76</sup>	81.8 <sup>21</sup>
29.2	54.64 <sup>6</sup>	68.9 <sup>0</sup>	57.70 <sup>17</sup>	83.5 <sup>17</sup>	46.64 <sup>9</sup>	68.1 <sup>12</sup>	15.06 <sup>67</sup>	79.7 <sup>25</sup>
Aug. 8.1	54.58 <sup>5</sup>	68.9 <sup>1</sup>	57.53 <sup>14</sup>	81.8 <sup>20</sup>	46.55 <sup>7</sup>	66.9 <sup>12</sup>	14.39 <sup>56</sup>	77.2 <sup>28</sup>
18.1	54.53 <sup>3</sup>	68.8 <sup>3</sup>	57.39 <sup>10</sup>	79.8 <sup>22</sup>	46.48 <sup>4</sup>	65.7 <sup>12</sup>	13.83 <sup>45</sup>	74.4 <sup>32</sup>
28.1	54.50 <sup>1</sup>	68.5 <sup>5</sup>	57.29 <sup>6</sup>	77.6 <sup>23</sup>	46.44 <sup>2</sup>	64.5 <sup>12</sup>	13.38 <sup>31</sup>	71.2 <sup>35</sup>
Sept. 7.0	54.49 <sup>2</sup>	68.0 <sup>7</sup>	57.23 <sup>0</sup>	75.3 <sup>23</sup>	46.42 <sup>2</sup>	63.3 <sup>11</sup>	13.07 <sup>17</sup>	67.7 <sup>37</sup>
17.0	54.51 <sup>6</sup>	67.3 <sup>9</sup>	57.23 <sup>5</sup>	73.0 <sup>23</sup>	46.44 <sup>5</sup>	62.2 <sup>9</sup>	12.90 <sup>2</sup>	64.0 <sup>38</sup>
27.0	54.57 <sup>10</sup>	66.4 <sup>12</sup>	57.28 <sup>12</sup>	70.7 <sup>21</sup>	46.49 <sup>10</sup>	61.3 <sup>7</sup>	12.88 <sup>14</sup>	60.2 <sup>39</sup>
Oct. 7.0	54.67 <sup>13</sup> <sup>18</sup>	65.2 <sup>14</sup> <sup>17</sup>	57.40 <sup>18</sup> <sup>25</sup>	68.6 <sup>18</sup> <sup>15</sup>	46.59 <sup>14</sup> <sup>19</sup>	60.6 <sup>4</sup> <sup>1</sup>	13.02 <sup>29</sup> <sup>46</sup>	56.3 <sup>38</sup> <sup>38</sup>
16.9	54.80	63.8	57.58	66.8	46.73	60.2	13.31	52.5
26.9	54.98	62.1	57.83	65.3	46.92	60.1	13.77	48.7
Nov. 5.9	55.20 <sup>22</sup>	60.3 <sup>18</sup>	58.14 <sup>31</sup>	64.2 <sup>11</sup>	47.15 <sup>23</sup>	60.4 <sup>3</sup>	14.39 <sup>62</sup>	45.2 <sup>35</sup>
15.9	55.45 <sup>25</sup>	58.2 <sup>21</sup>	58.51 <sup>37</sup>	63.6 <sup>6</sup>	47.42 <sup>27</sup>	61.1 <sup>7</sup>	15.16 <sup>77</sup>	42.0 <sup>32</sup>
25.8	55.74 <sup>29</sup>	56.0 <sup>22</sup>	58.92 <sup>41</sup>	63.6 <sup>0</sup>	47.73 <sup>31</sup>	62.1 <sup>10</sup>	16.06 <sup>90</sup>	39.1 <sup>29</sup>
Dec. 5.8	56.06 <sup>32</sup> <sup>33</sup>	53.8 <sup>22</sup> <sup>23</sup>	59.37 <sup>45</sup> <sup>46</sup>	64.1 <sup>5</sup> <sup>10</sup>	48.07 <sup>34</sup> <sup>35</sup>	63.5 <sup>14</sup> <sup>18</sup>	17.08 <sup>102</sup> <sup>111</sup>	36.7 <sup>24</sup> <sup>19</sup>
15.8	56.39	51.5	59.83	65.1	48.42	65.3	18.19	34.8
25.7	56.73 <sup>34</sup>	49.3 <sup>22</sup>	60.30 <sup>47</sup>	66.7 <sup>16</sup>	48.78 <sup>36</sup>	67.3 <sup>20</sup>	19.34 <sup>115</sup>	33.5 <sup>13</sup>
35.7	57.07 <sup>34</sup>	47.2 <sup>21</sup>	60.77 <sup>47</sup>	68.8 <sup>21</sup>	49.14 <sup>36</sup>	69.6 <sup>23</sup>	20.52 <sup>118</sup>	32.9 <sup>6</sup>
Tan δ	1.013	+0.162	1.564	-1.202	1.080	-0.407	4.843	+4.738
Place	52°.794	77''.97	56°.796	57''.05	45°.044	49''.52	13°.957	78''.74
D <sub>α</sub>	0.00	+0.01	0.00	-0.08	0.00	-0.03	0.00	+0.32
D <sub>δ</sub>	-0.4	0.0	-0.4	0.0	-0.4	0.0	-0.4	0.0



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♌ Crucis. Mag. 3.1		♊ Ursæ Majoris. Mag. 3.4		♍ Corvi. Mag. 2.8		♌ Canum Venat. Mag. 5.8	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 12 10 s	° ' " — 58 16 "	h m 12 11 s	° ' " + 57 29 "	h m 12 11 s	° ' " — 17 4 "	h m 12 11 s	° ' " + 41 7 "
Jan. 0.7	37.79	22.7	15.23	55.7	26.51	11.2	53.49	41.0
10.7	38.32 53	24.8 21	15.76 53	54.8 9	26.85 34	13.5 23	53.90 41	39.7 13
20.7	38.81 49	27.4 26	16.26 50	54.6 2	27.18 33	15.9 24	54.29 39	38.9 8
30.6	39.26 45	30.4 30	16.72 46	54.9 3	27.47 29	18.3 24	54.64 35	38.6 3
Feb. 9.6	39.65 39	33.6 32	17.13 41	55.9 10	27.73 26	20.6 23	54.96 32	38.8 2
	32	35	34	14	22	21	27	8
19.6	39.97	37.1	17.47	57.3	27.95	22.7	55.23	39.6
Mar. 1.6	40.23 26	40.6 35	17.74 27	59.2 19	28.13 18	24.7 20	55.44 21	40.7 11
11.5	40.42 19	44.1 35	17.94 20	61.4 22	28.27 14	26.5 18	55.60 16	42.2 15
21.5	40.54 12	47.6 35	18.05 11	63.9 25	28.37 10	28.1 16	55.70 10	44.0 18
31.5	40.60 6	50.9 33	18.09 4	66.5 26	28.43 6	29.4 13	55.75 5	46.0 20
	0	32	3	26	2	11	0	21
Apr. 10.5	40.60	54.1	18.06	69.1	28.45	30.5	55.75	48.1
20.4	40.55 5	57.0 29	17.96 10	71.7 26	28.45 0	31.4 9	55.71 4	50.2 21
30.4	40.44 11	59.6 26	17.81 15	74.1 24	28.42 3	32.0 6	55.63 8	52.2 20
May 10.4	40.29 15	61.8 22	17.62 19	76.1 20	28.36 6	32.4 4	55.52 11	54.0 18
20.3	40.11 18	63.7 19	17.39 23	77.9 18	28.30 6	32.6 2	55.39 13	55.6 16
	22	14	26	14	8	0	15	14
30.3	39.89	65.1	17.13	79.3	28.22	32.6	55.24	57.0
June 9.3	39.65 24	66.1 10	16.86 27	80.2 9	28.13 9	32.4 2	55.08 16	58.0 10
19.3	39.39 26	66.6 5	16.58 28	80.7 5	28.03 10	32.0 4	54.91 17	58.6 6
29.2	39.12 27	66.7 1	16.30 28	80.7 0	27.93 10	31.5 5	54.75 16	58.9 3
July 9.2	38.84 28	66.3 4	16.03 27	80.2 5	27.83 10	30.8 7	54.59 16	58.8 1
	27	9	26	10	10	8	15	5
19.2	38.57	65.4	15.77	79.2	27.73	30.0	54.44	58.3
29.2	38.32 25	64.0 14	15.54 23	77.8 14	27.63 10	29.1 9	54.30 14	57.5 8
Aug. 8.1	38.09 23	62.3 17	15.33 21	76.0 18	27.55 8	28.1 10	54.18 12	56.3 12
18.1	37.89 20	60.3 20	15.16 17	73.8 22	27.49 6	27.1 10	54.08 10	54.7 16
28.1	37.74 15	58.0 23	15.03 13	71.2 26	27.44 5	26.1 10	54.00 8	52.9 18
	9	25	8	29	2	9	4	22
Sept. 7.0	37.65	55.5	14.95	68.3	27.42	25.2	53.96	50.7
17.0	37.61 4	52.9 26	14.92 3	65.2 31	27.43 1	24.4 8	53.96 0	48.2 25
27.0	37.65 4	50.4 25	14.95 3	61.9 33	27.48 5	23.7 7	54.00 4	45.5 27
Oct. 7.0	37.77 12	47.9 25	15.04 9	58.4 35	27.57 9	23.3 4	54.08 8	42.7 28
16.9	37.97 20	45.7 22	15.19 15	54.9 35	27.70 13	23.2 1	54.21 13	39.7 30
	28	18	22	36	18	2	18	31
26.9	38.25	43.9	15.41	51.3	27.88	23.4	54.39	36.6
Nov. 5.9	38.60 35	42.4 15	15.70 29	47.9 34	28.10 22	23.9 5	54.63 24	33.5 31
15.9	39.02 42	41.4 10	16.06 36	44.6 33	28.36 26	24.8 9	54.91 28	30.4 31
25.8	39.50 48	41.0 4	16.47 41	41.6 30	28.66 30	26.0 12	55.24 33	27.5 29
Dec. 5.8	40.02 52	41.2 2	16.93 46	38.9 27	28.98 32	27.5 15	55.60 36	24.8 27
	54	7	50	23	35	19	39	24
15.8	40.56	41.9	17.43	36.6	29.33	29.4	55.99	22.4
25.7	41.11 55	43.3 14	17.95 52	34.9 17	29.68 35	31.5 21	56.40 41	20.3 21
35.7	41.66 55	45.1 18	18.47 52	33.6 13	30.03 35	33.7 22	56.81 41	18.7 16
Sec δ, Tan δ	1.902	−1.618	1.861	+1.570	1.046	−0.307	1.328	+0.873
Mean Place	37°.713	35''.20	13°.649	77''.54	25°.941	11''.83	52°.324	59''.40
D'ψ α, Dω α	0.00	−0.11	0.00	+0.10	0.00	−0.02	0.00	+0.06
Dψ δ, Dω δ	−0.4	0.0	−0.4	0.0	−0.4	0.0	−0.4	−0.1

FOR THE UPPER TRANSIT AT WASHINGTON.

m Solar Date.	$\beta$ Chamæleontis. Mag. 4.4		$\eta$ Virginis. Mag. 4.0		$\alpha^1$ Crucis. Mag. 1.6		20 Comæ. Mag. 5.7	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 12 13 s	° ' " —78 50 "	h m 12 15 s	° ' " — 0 11 "	h m 12 21 s	° ' " —62 37 "	h m 12 25 s	° ' " +21 21 "
n. 0.7	18.80	9.3	34.11	45.7	51.41	28.3	27.99	46.9
10.7	20.03 <sup>123</sup>	11.1 <sup>18</sup>	34.45 <sup>34</sup>	47.9 <sup>22</sup>	52.01 <sup>60</sup>	30.3 <sup>20</sup>	28.34 <sup>35</sup>	45.1 <sup>18</sup>
20.7	21.19 <sup>116</sup>	13.4 <sup>23</sup>	34.76 <sup>31</sup>	49.9 <sup>20</sup>	52.57 <sup>56</sup>	32.7 <sup>24</sup>	28.68 <sup>34</sup>	43.6 <sup>15</sup>
30.7	22.23 <sup>104</sup>	16.2 <sup>28</sup>	35.05 <sup>29</sup>	51.8 <sup>19</sup>	53.08 <sup>51</sup>	35.6 <sup>29</sup>	28.99 <sup>31</sup>	42.4 <sup>12</sup>
b. 9.6	23.13 <sup>90</sup>	19.4 <sup>32</sup>	35.31 <sup>26</sup>	53.4 <sup>16</sup>	53.53 <sup>45</sup>	38.7 <sup>31</sup>	29.27 <sup>28</sup>	41.7 <sup>7</sup>
	74	35	22	14	38	34	24	3
19.6	23.87	22.9	35.53	54.8	53.91	42.1	29.51	41.4
tr. 1.6	24.45 <sup>58</sup>	26.6 <sup>37</sup>	35.71 <sup>18</sup>	55.9 <sup>11</sup>	54.22 <sup>31</sup>	45.6 <sup>35</sup>	29.71 <sup>20</sup>	41.5 <sup>1</sup>
11.5	24.86 <sup>41</sup>	30.5 <sup>39</sup>	35.85 <sup>14</sup>	56.7 <sup>8</sup>	54.45 <sup>23</sup>	49.2 <sup>36</sup>	29.87 <sup>16</sup>	41.9 <sup>4</sup>
21.5	25.10 <sup>24</sup>	34.4 <sup>39</sup>	35.95 <sup>10</sup>	57.2 <sup>5</sup>	54.61 <sup>16</sup>	52.8 <sup>36</sup>	29.98 <sup>11</sup>	42.6 <sup>7</sup>
31.5	25.17 <sup>7</sup>	38.2 <sup>38</sup>	36.01 <sup>6</sup>	57.5 <sup>3</sup>	54.70 <sup>9</sup>	56.3 <sup>35</sup>	30.04 <sup>6</sup>	43.6 <sup>10</sup>
	10	38	3	1	1	33	3	12
r. 10.5	25.07	42.0	36.04	57.6	54.71	59.6	30.07	44.8
20.4	24.82 <sup>25</sup>	45.5 <sup>35</sup>	36.04 <sup>0</sup>	57.5 <sup>1</sup>	54.67 <sup>4</sup>	62.7 <sup>31</sup>	30.07 <sup>0</sup>	46.1 <sup>13</sup>
30.4	24.42 <sup>40</sup>	48.7 <sup>32</sup>	36.01 <sup>3</sup>	57.3 <sup>2</sup>	54.56 <sup>11</sup>	65.5 <sup>28</sup>	30.04 <sup>3</sup>	47.4 <sup>13</sup>
y 10.4	23.89 <sup>53</sup>	51.7 <sup>30</sup>	35.97 <sup>4</sup>	56.9 <sup>4</sup>	54.40 <sup>16</sup>	68.0 <sup>25</sup>	29.98 <sup>6</sup>	48.7 <sup>13</sup>
20.4	23.24 <sup>65</sup>	54.2 <sup>25</sup>	35.91 <sup>6</sup>	56.4 <sup>5</sup>	54.20 <sup>20</sup>	70.1 <sup>21</sup>	29.91 <sup>7</sup>	50.0 <sup>13</sup>
	75	21	8	5	25	17	9	11
30.3	22.49	56.3	35.83	55.9	53.95	71.8	29.82	51.1
ne 9.3	21.66 <sup>83</sup>	57.9 <sup>16</sup>	35.75 <sup>8</sup>	55.3 <sup>6</sup>	53.67 <sup>28</sup>	73.0 <sup>12</sup>	29.72 <sup>10</sup>	52.1 <sup>10</sup>
19.3	20.76 <sup>90</sup>	58.9 <sup>10</sup>	35.66 <sup>9</sup>	54.7 <sup>6</sup>	53.37 <sup>30</sup>	73.8 <sup>8</sup>	29.61 <sup>11</sup>	52.9 <sup>8</sup>
29.2	19.83 <sup>93</sup>	59.4 <sup>5</sup>	35.57 <sup>9</sup>	54.1 <sup>6</sup>	53.05 <sup>32</sup>	74.0 <sup>2</sup>	29.50 <sup>11</sup>	53.5 <sup>6</sup>
ly 9.2	18.89 <sup>94</sup>	59.4 <sup>0</sup>	35.47 <sup>10</sup>	53.5 <sup>6</sup>	52.72 <sup>33</sup>	73.8 <sup>2</sup>	29.39 <sup>11</sup>	53.9 <sup>4</sup>
	93	6	9	6	33	7	11	1
19.2	17.96	58.8	35.38	52.9	52.39	73.1	29.28	54.0
29.2	17.08 <sup>88</sup>	57.7 <sup>11</sup>	35.30 <sup>8</sup>	52.4 <sup>5</sup>	52.07 <sup>32</sup>	71.9 <sup>12</sup>	29.18 <sup>10</sup>	53.9 <sup>1</sup>
lg. 8.1	16.29 <sup>79</sup>	56.1 <sup>16</sup>	35.22 <sup>8</sup>	52.0 <sup>4</sup>	51.79 <sup>28</sup>	70.3 <sup>16</sup>	29.09 <sup>9</sup>	53.5 <sup>4</sup>
18.1	15.60 <sup>69</sup>	54.1 <sup>20</sup>	35.16 <sup>6</sup>	51.7 <sup>3</sup>	51.54 <sup>25</sup>	68.3 <sup>20</sup>	29.02 <sup>7</sup>	52.9 <sup>6</sup>
28.1	15.05 <sup>55</sup>	51.6 <sup>25</sup>	35.12 <sup>4</sup>	51.5 <sup>2</sup>	51.34 <sup>20</sup>	66.0 <sup>23</sup>	28.96 <sup>6</sup>	52.0 <sup>9</sup>
	40	27	2	0	14	25	3	11
pt. 7.1	14.65	48.9	35.10	51.5	51.20	63.5	28.93	50.9
17.0	14.44 <sup>21</sup>	46.0 <sup>29</sup>	35.11 <sup>1</sup>	51.6 <sup>1</sup>	51.13 <sup>7</sup>	60.9 <sup>26</sup>	28.92 <sup>1</sup>	49.5 <sup>14</sup>
27.0	14.43 <sup>1</sup>	43.0 <sup>30</sup>	35.15 <sup>4</sup>	52.0 <sup>4</sup>	51.15 <sup>2</sup>	58.2 <sup>27</sup>	28.95 <sup>3</sup>	47.9 <sup>16</sup>
t. 7.0	14.63 <sup>20</sup>	40.0 <sup>30</sup>	35.24 <sup>9</sup>	52.6 <sup>6</sup>	51.25 <sup>10</sup>	55.6 <sup>26</sup>	29.02 <sup>7</sup>	46.0 <sup>19</sup>
16.9	15.05 <sup>42</sup>	37.2 <sup>28</sup>	35.36 <sup>12</sup>	53.5 <sup>9</sup>	51.45 <sup>20</sup>	53.2 <sup>24</sup>	29.12 <sup>10</sup>	43.9 <sup>21</sup>
	63	25	16	12	29	21	16	23
26.9	15.68	34.7	35.52	54.7	51.74	51.1	29.28	41.6
iv. 5.9	16.50 <sup>82</sup>	32.6 <sup>21</sup>	35.73 <sup>21</sup>	56.1 <sup>14</sup>	52.12 <sup>38</sup>	49.4 <sup>17</sup>	29.48 <sup>20</sup>	39.2 <sup>24</sup>
15.9	17.48 <sup>98</sup>	30.9 <sup>17</sup>	35.97 <sup>24</sup>	57.7 <sup>16</sup>	52.57 <sup>45</sup>	48.2 <sup>12</sup>	29.72 <sup>24</sup>	36.6 <sup>26</sup>
25.8	18.60 <sup>112</sup>	29.8 <sup>11</sup>	36.25 <sup>28</sup>	59.6 <sup>19</sup>	53.09 <sup>52</sup>	47.5 <sup>7</sup>	30.00 <sup>28</sup>	34.0 <sup>26</sup>
xc. 5.8	19.82 <sup>122</sup>	29.3 <sup>5</sup>	36.56 <sup>31</sup>	61.6 <sup>20</sup>	53.66 <sup>57</sup>	47.4 <sup>1</sup>	30.31 <sup>31</sup>	31.5 <sup>25</sup>
	128	1	33	22	60	4	34	25
15.8	21.10	29.4	36.89	63.8	54.26	47.8	30.65	29.0
25.8	22.40 <sup>130</sup>	30.2 <sup>8</sup>	37.23 <sup>34</sup>	66.0 <sup>22</sup>	54.88 <sup>62</sup>	48.9 <sup>11</sup>	31.00 <sup>35</sup>	26.8 <sup>22</sup>
35.7	23.68 <sup>128</sup>	31.6 <sup>14</sup>	37.57 <sup>34</sup>	68.2 <sup>22</sup>	55.49 <sup>61</sup>	50.5 <sup>16</sup>	31.35 <sup>35</sup>	24.7 <sup>21</sup>
$\delta$ , Tan $\delta$	5.168	—5.070	1.000	—0.003	2.175	—1.932	1.074	+0.391
m Place	19°.926	24''.94	33°.429	40''.25	51°.556	41''.44	27°.180	60''.10
$\alpha$ , $D_{\alpha\alpha}$	+0.01	—0.34	0.00	0.00	0.00	—0.13	0.00	+0.03
$\delta$ , $D_{\alpha\delta}$	—0.4	—0.1	—0.4	—0.1	—0.4	—0.1	—0.4	—0.1



**FOR THE UPPER TRANSIT AT WASHINGTON.**

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\gamma$ Centauri. Mag. 2.4		$\gamma$ Virginis (mean). Mag. 2.9		$\rho$ Virginis. Mag. 5.0		78 Ursæ Majoris. Mag. 5.9	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 12 36 s	° ' " -48 29 "	h m 12 37 s	° ' " - 0 59 "	h m 12 37 s	° ' " +10 41 "	h m 12 37 s	° ' " +63 10 "
Jan. 0.7	49.42	25.9	21.76	5.9	35.61	63.7	52.81	22.8
10.7	49.87 45	27.9 20	22.09 33	8.1 22	35.95 34	61.6 21	53.41 60	21.8 10
20.7	50.31 44	30.3 24	22.42 33	10.1 20	36.28 33	59.8 18	53.99 58	21.4 4
30.7	50.71 40	33.0 27	22.72 30	12.0 19	36.59 31	58.3 15	54.54 55	21.6 2
Feb. 9.6	51.07 36	35.9 29	22.99 27	13.7 17	36.87 28	57.0 13	55.04 50	22.5 9
	31	30	24	14	24	8	44	14
19.6	51.38	38.9	23.23	15.1	37.11	56.2	55.48	23.9
Mar. 1.6	51.64 26	42.0 31	23.43 20	16.2 11	37.31 20	55.7 5	55.83 35	25.8 10
11.6	51.85 21	45.2 32	23.59 16	17.1 9	37.47 16	55.5 2	56.10 27	28.1 23
21.5	52.00 15	48.3 31	23.71 12	17.7 6	37.59 12	55.6 1	56.27 17	30.7 26
31.5	52.10 10	51.2 29	23.79 8	18.0 3	37.67 8	56.0 4	56.36 9	33.5 28
	6	28	5	1	5	5	0	28
Apr. 10.5	52.16	54.0	23.84	18.1	37.72	56.5	56.36	36.3
20.4	52.17 1	56.5 25	23.86 2	18.0 1	37.74 2	57.3 8	56.27 9	39.1 28
30.4	52.14 3	58.8 23	23.85 1	17.8 2	37.72 2	58.2 9	56.12 15	41.7 26
May 10.4	52.07 7	60.8 20	23.82 3	17.4 4	37.69 3	59.1 9	55.91 21	44.1 24
20.4	51.97 10	62.5 17	23.77 5	16.9 5	37.64 5	60.0 9	55.64 27	46.2 21
	12	13	6	5	7	9	31	16
30.3	51.85	63.8	23.71	16.4	37.57	60.9	55.33	47.8
June 9.3	51.70 15	64.7 9	23.63 8	15.8 6	37.48 9	61.8 9	54.99 34	49.0 12
19.3	51.53 17	65.2 5	23.55 8	15.2 6	37.39 9	62.5 7	54.64 35	49.7 7
29.3	51.34 19	65.3 1	23.46 9	14.6 6	37.30 9	63.2 7	54.27 37	49.9 2
July 9.2	51.15 19	65.0 3	23.36 10	14.0 6	37.20 10	63.7 5	53.91 36	49.6 3
	20	7	10	6	10	4	35	8
19.2	50.95	64.3	23.26	13.4	37.10	64.1	53.56	48.8
29.2	50.76 19	63.3 10	23.17 9	12.9 5	37.00 10	64.3 2	53.23 33	47.5 13
Aug. 8.1	50.58 18	61.8 15	23.08 9	12.5 4	36.91 9	64.4 1	52.93 30	45.8 17
	16	17	8	3	7	2	27	22
18.1	50.42	60.1	23.00	12.2	36.84	64.2	52.66	43.6
28.1	50.29 13	58.2 19	22.94 6	11.9 3	36.77 7	63.9 3	52.43 23	41.0 26
	9	21	4	0	4	5	17	29
Sept. 7.1	50.20	56.1	22.90	11.9	36.73	63.4	52.26	38.1
17.0	50.15 5	53.9 22	22.89 1	12.0 1	36.72 1	62.6 8	52.15 11	34.9 32
27.0	50.16 1	51.7 22	22.91 2	12.3 3	36.74 2	61.6 10	52.10 5	31.4 35
Oct. 7.0	50.23 7	49.7 20	22.97 6	12.8 5	36.80 6	60.3 13	52.13 3	27.8 36
17.0	50.36 13	47.8 19	23.07 10	13.6 8	36.89 9	58.8 15	52.23 10	24.1 37
	20	16	14	11	14	17	18	37
26.9	50.56	46.2	23.21	14.7	37.03	57.1	52.41	20.4
Nov. 5.9	50.83 27	44.9 13	23.40 19	16.0 13	37.22 19	55.1 20	52.68 27	16.7 37
15.9	51.15 32	44.2 7	23.63 23	17.6 16	37.45 23	53.0 21	53.03 35	13.2 35
25.8	51.53 38	43.9 3	23.90 27	19.4 18	37.71 26	50.8 22	53.45 42	10.0 32
Dec. 5.8	51.95 42	44.1 2	24.20 30	21.4 20	38.01 30	48.4 24	53.93 48	7.1 29
	44	7	32	21	32	23	54	25
15.8	52.39	44.8	24.52	23.5	38.33	46.1	54.47	4.6
25.8	52.85 46	46.1 13	24.86 34	25.7 22	38.67 34	43.8 23	55.04 57	2.6 20
35.7	53.32 47	47.8 17	25.19 33	27.9 22	39.02 35	41.6 22	55.64 60	1.2 14
Sec $\delta$ , Tan $\delta$	1.509	-1.131	1.000	-0.017	1.018	+0.189	2.216	+1.077
Mean Place	49° 36' 2	35'' 47	21° 21' 0	0'' 07	34° 9' 74	73'' 65	51° 39' 0	46'' 47
D' $\psi$ $\alpha$ , D $\omega$ $\alpha$	0.00	-0.07	0.00	0.00	0.00	+0.01	-0.01	+0.13
D $\psi$ $\delta$ , D $\omega$ $\delta$	-0.4	-0.2	-0.4	-0.2	-0.4	-0.2	-0.4	-0.2

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Crucis. Mag. 1.5		31 Comæ. Mag. 5.1		32 H. Camelop. seq. Mag. 5.3		$\eta$ Centauri. Mag. 4.3	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 12 42 s	° ' - 59 13 "	h m 12 47 s	° ' + 27 59 "	h m 12 48 s	° ' + 83 51 "	h m 12 48 s	° ' - 39 42 "
Jan. 0.8	44.44	15.8	34.27	54.9	33.41	64.1	43.55	53.7
10.7	45.00 <sup>56</sup>	17.6 <sup>18</sup>	34.64 <sup>37</sup>	53.0 <sup>19</sup>	35.55 <sup>214</sup>	63.4 <sup>7</sup>	43.96 <sup>41</sup>	55.7 <sup>20</sup>
20.7	45.53 <sup>53</sup>	19.8 <sup>22</sup>	34.99 <sup>35</sup>	51.6 <sup>14</sup>	37.67 <sup>212</sup>	63.5 <sup>1</sup>	44.36 <sup>40</sup>	58.0 <sup>23</sup>
30.7	46.03 <sup>50</sup>	22.4 <sup>26</sup>	35.33 <sup>34</sup>	50.6 <sup>10</sup>	39.70 <sup>203</sup>	64.1 <sup>6</sup>	44.73 <sup>37</sup>	60.5 <sup>25</sup>
Feb. 9.6	46.48 <sup>45</sup>	25.4 <sup>30</sup>	35.63 <sup>30</sup>	50.0 <sup>6</sup>	41.56 <sup>186</sup>	65.4 <sup>13</sup>	45.06 <sup>33</sup>	63.2 <sup>27</sup>
	39	31	27	1	162	19	29	27
19.6	46.87	28.5	35.90	49.9	43.18	67.3	45.35	65.9
Mar. 1.6	47.20 <sup>33</sup>	31.9 <sup>34</sup>	36.13 <sup>23</sup>	50.3 <sup>4</sup>	44.51 <sup>133</sup>	69.6 <sup>23</sup>	45.61 <sup>26</sup>	68.7 <sup>28</sup>
	26	34	18	7	98	27	20	28
11.6	47.46 <sup>26</sup>	35.3 <sup>34</sup>	36.31 <sup>18</sup>	51.0 <sup>7</sup>	45.49 <sup>98</sup>	72.3 <sup>27</sup>	45.81 <sup>20</sup>	71.5 <sup>28</sup>
21.5	47.65 <sup>19</sup>	38.7 <sup>34</sup>	36.44 <sup>13</sup>	52.1 <sup>11</sup>	46.11 <sup>62</sup>	75.2 <sup>29</sup>	45.96 <sup>15</sup>	74.2 <sup>27</sup>
31.5	47.78 <sup>13</sup>	42.0 <sup>33</sup>	36.53 <sup>9</sup>	53.5 <sup>14</sup>	46.34 <sup>23</sup>	78.3 <sup>31</sup>	46.08 <sup>12</sup>	76.7 <sup>25</sup>
	6	32	5	15	15	31	7	24
Apr. 10.5	47.84	45.2	36.58	55.0	46.19	81.4	46.15	79.1
20.5	47.85 <sup>1</sup>	48.2 <sup>30</sup>	36.60 <sup>2</sup>	56.7 <sup>17</sup>	45.67 <sup>52</sup>	84.4 <sup>30</sup>	46.18 <sup>3</sup>	81.2 <sup>21</sup>
30.4	47.81 <sup>4</sup>	51.0 <sup>28</sup>	36.58 <sup>2</sup>	58.4 <sup>17</sup>	44.81 <sup>86</sup>	87.1 <sup>27</sup>	46.18 <sup>0</sup>	83.1 <sup>19</sup>
May 10.4	47.71 <sup>10</sup>	53.5 <sup>25</sup>	36.53 <sup>5</sup>	60.0 <sup>16</sup>	43.65 <sup>116</sup>	89.5 <sup>24</sup>	46.15 <sup>3</sup>	84.7 <sup>16</sup>
20.4	47.57 <sup>14</sup>	55.6 <sup>21</sup>	36.46 <sup>7</sup>	61.6 <sup>16</sup>	42.23 <sup>142</sup>	91.6 <sup>21</sup>	46.09 <sup>6</sup>	86.1 <sup>14</sup>
	18	18	9	14	162	15	9	10
30.3	47.39	57.4	36.37	63.0	40.61	93.1	46.00	87.1
June 9.3	47.17 <sup>22</sup>	58.7 <sup>13</sup>	36.26 <sup>11</sup>	64.2 <sup>12</sup>	38.84 <sup>177</sup>	94.2 <sup>11</sup>	45.90 <sup>10</sup>	87.8 <sup>7</sup>
19.3	46.93 <sup>24</sup>	59.6 <sup>9</sup>	36.15 <sup>11</sup>	65.2 <sup>10</sup>	36.96 <sup>188</sup>	94.7 <sup>5</sup>	45.77 <sup>13</sup>	88.1 <sup>3</sup>
29.3	46.66 <sup>27</sup>	60.0 <sup>4</sup>	36.03 <sup>12</sup>	65.9 <sup>7</sup>	35.03 <sup>193</sup>	94.6 <sup>1</sup>	45.63 <sup>14</sup>	88.2 <sup>1</sup>
July 9.2	46.38 <sup>28</sup>	60.0 <sup>0</sup>	35.90 <sup>13</sup>	66.3 <sup>4</sup>	33.11 <sup>192</sup>	94.0 <sup>6</sup>	45.48 <sup>15</sup>	87.8 <sup>4</sup>
	29	6	13	1	188	12	15	6
19.2	46.09	59.4	35.77	66.4	31.23	92.8	45.33	87.2
29.2	45.81 <sup>28</sup>	58.5 <sup>9</sup>	35.64 <sup>13</sup>	66.2 <sup>2</sup>	29.44 <sup>179</sup>	91.1 <sup>17</sup>	45.17 <sup>16</sup>	86.2 <sup>10</sup>
Aug. 8.2	45.55 <sup>26</sup>	57.1 <sup>14</sup>	35.52 <sup>12</sup>	65.7 <sup>5</sup>	27.79 <sup>165</sup>	89.0 <sup>21</sup>	45.02 <sup>15</sup>	85.0 <sup>12</sup>
	24	18	10	8	149	26	13	14
18.1	45.31 <sup>24</sup>	55.3 <sup>18</sup>	35.42 <sup>10</sup>	64.9 <sup>8</sup>	26.30 <sup>149</sup>	86.4 <sup>26</sup>	44.89 <sup>13</sup>	83.6 <sup>14</sup>
28.1	45.11 <sup>20</sup>	53.2 <sup>21</sup>	35.33 <sup>9</sup>	63.8 <sup>11</sup>	25.01 <sup>129</sup>	83.4 <sup>30</sup>	44.78 <sup>11</sup>	81.9 <sup>17</sup>
	15	23	6	14	106	34	8	18
Sept. 7.1	44.96	50.9	35.27	62.4	23.95	80.0	44.70	80.1
17.0	44.87 <sup>9</sup>	48.4 <sup>25</sup>	35.24 <sup>3</sup>	60.7 <sup>17</sup>	23.15 <sup>80</sup>	76.5 <sup>35</sup>	44.66 <sup>4</sup>	78.3 <sup>18</sup>
27.0	44.86 <sup>1</sup>	45.9 <sup>25</sup>	35.24 <sup>0</sup>	58.7 <sup>20</sup>	22.63 <sup>52</sup>	72.7 <sup>38</sup>	44.66 <sup>0</sup>	76.5 <sup>18</sup>
Oct. 7.0	44.92 <sup>6</sup>	43.4 <sup>25</sup>	35.28 <sup>4</sup>	56.5 <sup>22</sup>	22.40 <sup>23</sup>	68.8 <sup>39</sup>	44.71 <sup>5</sup>	74.9 <sup>16</sup>
17.0	45.07 <sup>15</sup>	41.1 <sup>23</sup>	35.36 <sup>8</sup>	54.1 <sup>24</sup>	22.49 <sup>9</sup>	64.9 <sup>39</sup>	44.82 <sup>11</sup>	73.4 <sup>15</sup>
	23	21	13	26	41	38	17	12
26.9	45.30	39.0	35.49	51.5	22.90	61.1	44.99	72.2
Nov. 5.9	45.61 <sup>31</sup>	37.2 <sup>18</sup>	35.67 <sup>18</sup>	48.7 <sup>28</sup>	23.63 <sup>73</sup>	57.3 <sup>38</sup>	45.21 <sup>22</sup>	71.3 <sup>9</sup>
15.9	46.00 <sup>39</sup>	35.9 <sup>13</sup>	35.89 <sup>22</sup>	45.9 <sup>28</sup>	24.67 <sup>104</sup>	53.8 <sup>35</sup>	45.49 <sup>28</sup>	70.9 <sup>4</sup>
25.9	46.46 <sup>46</sup>	35.1 <sup>8</sup>	36.16 <sup>27</sup>	43.1 <sup>28</sup>	26.00 <sup>133</sup>	50.7 <sup>31</sup>	45.82 <sup>33</sup>	70.8 <sup>1</sup>
Dec. 5.8	46.97 <sup>51</sup>	34.9 <sup>2</sup>	36.47 <sup>31</sup>	40.3 <sup>28</sup>	27.60 <sup>160</sup>	47.9 <sup>28</sup>	46.18 <sup>36</sup>	71.3 <sup>5</sup>
	55	3	33	26	182	22	40	9
15.8	47.52	35.2	36.80	37.7	29.42	45.7	46.58	72.2
25.8	48.08 <sup>56</sup>	36.1 <sup>9</sup>	37.15 <sup>35</sup>	35.3 <sup>24</sup>	31.41 <sup>199</sup>	44.0 <sup>17</sup>	46.99 <sup>41</sup>	73.6 <sup>14</sup>
35.7	48.65 <sup>57</sup>	37.5 <sup>14</sup>	37.52 <sup>37</sup>	33.2 <sup>21</sup>	33.50 <sup>209</sup>	42.9 <sup>11</sup>	47.41 <sup>42</sup>	75.3 <sup>17</sup>
Sec $\delta$ , Tan $\delta$	1.955	-1.679	1.133	+0.532	9.364	+9.310	1.300	-0.831
Mean Place	44°.680	27''.68	33°.559	70''.80	29°.536	89''.63	43°.435	60''.51
D $\delta$ $\alpha$ , D $\alpha$ $\alpha$	+0.01	-0.11	0.00	+0.03	-0.05	+0.61	0.00	-0.05
D $\delta$ $\delta$ , D $\alpha$ $\delta$	-0.4	-0.2	-0.4	-0.2	-0.4	-0.2	-0.4	-0.2

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ε Ursæ Majoris. (Alioth.) Mag. 1.7		δ Virginis. Mag. 3.7		α Can. Ven. seq. Mag. 2.9		δ Muscæ. Mag. 3.6	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 12 50 s	° ' " + 56 24 "	h m 12 51 s	° ' " + 3 51 "	h m 12 52 s	° ' " + 38 45 "	h m 12 56 s	° ' " - 71 5 "
Jan. 0.8	18.69	52.7	19.77	25.1	4.02	78.9	23.09	12.8
10.7	19.20 <sup>51</sup>	51.4 <sup>13</sup>	20.11 <sup>34</sup>	22.9 <sup>22</sup>	4.41 <sup>39</sup>	77.2 <sup>17</sup>	23.93 <sup>84</sup>	14.1 <sup>13</sup>
20.7	19.70 <sup>50</sup>	50.6 <sup>8</sup>	20.44 <sup>33</sup>	20.9 <sup>20</sup>	4.80 <sup>39</sup>	76.0 <sup>12</sup>	24.73 <sup>80</sup>	15.9 <sup>18</sup>
30.7	20.18 <sup>48</sup>	50.5 <sup>1</sup>	20.75 <sup>31</sup>	19.2 <sup>17</sup>	5.16 <sup>36</sup>	75.3 <sup>7</sup>	25.48 <sup>75</sup>	18.3 <sup>24</sup>
Feb. 9.6	20.61 <sup>43</sup> 38	51.0 <sup>5</sup> 11	21.03 <sup>28</sup> 24	17.7 <sup>15</sup> 12	5.50 <sup>34</sup> 30	75.1 <sup>2</sup> 4	26.17 <sup>69</sup> 60	21.1 <sup>28</sup> 31
19.6	20.99	52.1	21.27	16.5	5.80	75.5	26.77	24.2
Mar. 1.6	21.31 <sup>32</sup>	53.7 <sup>16</sup>	21.48 <sup>21</sup>	15.6 <sup>9</sup>	6.05 <sup>25</sup>	76.3 <sup>8</sup>	27.29 <sup>52</sup>	27.6 <sup>34</sup>
11.6	21.56 <sup>25</sup>	55.7 <sup>20</sup>	21.66 <sup>18</sup>	15.0 <sup>6</sup>	6.25 <sup>20</sup>	77.6 <sup>13</sup>	27.71 <sup>42</sup>	31.1 <sup>35</sup>
21.5	21.74 <sup>18</sup>	58.0 <sup>23</sup>	21.79 <sup>13</sup>	14.7 <sup>3</sup>	6.39 <sup>14</sup>	79.2 <sup>16</sup>	28.03 <sup>32</sup>	34.7 <sup>36</sup>
31.5	21.84 <sup>10</sup> 4	60.6 <sup>26</sup> 27	21.89 <sup>10</sup> 6	14.7 <sup>0</sup> 2	6.49 <sup>10</sup> 5	81.1 <sup>19</sup> 20	28.24 <sup>21</sup> 12	38.4 <sup>37</sup> 36
Apr. 10.5	21.88	63.3	21.95	14.9	6.54	83.1	28.36	42.0
20.5	21.85 <sup>3</sup>	66.0 <sup>27</sup>	21.98 <sup>3</sup>	15.2 <sup>3</sup>	6.55 <sup>1</sup>	85.3 <sup>22</sup>	28.38 <sup>2</sup>	45.4 <sup>34</sup>
30.4	21.76 <sup>9</sup>	68.6 <sup>26</sup>	21.98 <sup>0</sup>	15.8 <sup>6</sup>	6.52 <sup>3</sup>	87.4 <sup>21</sup>	28.32 <sup>6</sup>	48.6 <sup>32</sup>
May 10.4	21.62 <sup>14</sup>	71.0 <sup>24</sup>	21.96 <sup>2</sup>	16.4 <sup>6</sup>	6.45 <sup>7</sup>	89.4 <sup>20</sup>	28.16 <sup>16</sup>	51.6 <sup>30</sup>
20.4	21.43 <sup>19</sup> 22	73.1 <sup>21</sup> 18	21.92 <sup>4</sup> 6	17.1 <sup>7</sup> 7	6.35 <sup>10</sup> 11	91.3 <sup>19</sup> 17	27.92 <sup>24</sup> 31	54.3 <sup>27</sup> 22
30.3	21.21	74.9	21.86	17.8	6.24	93.0	27.61	56.5
June 9.3	20.97 <sup>24</sup>	76.3 <sup>14</sup>	21.79 <sup>7</sup>	18.6 <sup>8</sup>	6.10 <sup>14</sup>	94.3 <sup>13</sup>	27.24 <sup>37</sup>	58.3 <sup>18</sup>
19.3	20.70 <sup>27</sup>	77.2 <sup>9</sup>	21.71 <sup>8</sup>	19.3 <sup>7</sup>	5.95 <sup>15</sup>	95.4 <sup>11</sup>	26.82 <sup>42</sup>	59.7 <sup>14</sup>
29.3	20.43 <sup>27</sup>	77.7 <sup>5</sup>	21.62 <sup>9</sup>	19.9 <sup>6</sup>	5.79 <sup>16</sup>	96.1 <sup>7</sup>	26.35 <sup>47</sup>	60.6 <sup>9</sup>
July 9.2	20.15 <sup>28</sup> 27	77.7 <sup>0</sup> 5	21.52 <sup>10</sup> 10	20.5 <sup>6</sup> 5	5.63 <sup>16</sup> 17	96.4 <sup>3</sup> 1	25.85 <sup>50</sup> 51	60.9 <sup>3</sup> 1
19.2	19.88	77.2	21.42	21.0	5.46	96.3	25.34	60.8
29.2	19.62 <sup>26</sup>	76.2 <sup>10</sup>	21.32 <sup>10</sup>	21.4 <sup>4</sup>	5.31 <sup>15</sup>	95.8 <sup>5</sup>	24.83 <sup>51</sup>	60.1 <sup>7</sup>
Aug. 8.2	19.37 <sup>25</sup>	74.8 <sup>14</sup>	21.22 <sup>10</sup>	21.7 <sup>3</sup>	5.16 <sup>15</sup>	95.0 <sup>8</sup>	24.35 <sup>48</sup>	58.9 <sup>12</sup>
18.1	19.15 <sup>22</sup>	73.0 <sup>18</sup>	21.14 <sup>8</sup>	21.9 <sup>2</sup>	5.02 <sup>14</sup>	93.8 <sup>12</sup>	23.90 <sup>45</sup>	57.2 <sup>17</sup>
28.1	18.96 <sup>19</sup> 15	70.7 <sup>23</sup> 26	21.07 <sup>7</sup> 5	21.9 <sup>0</sup> 2	4.91 <sup>11</sup> 9	92.3 <sup>15</sup> 19	23.52 <sup>38</sup> 30	55.2 <sup>20</sup> 24
Sept. 7.1	18.81	68.1	21.02	21.7	4.82	90.4	23.22	52.8
17.0	18.71 <sup>10</sup>	65.2 <sup>29</sup>	20.99 <sup>3</sup>	21.3 <sup>4</sup>	4.77 <sup>5</sup>	88.2 <sup>22</sup>	23.01 <sup>21</sup>	50.1 <sup>27</sup>
27.0	18.66 <sup>5</sup>	62.0 <sup>32</sup>	21.00 <sup>1</sup>	20.7 <sup>6</sup>	4.75 <sup>2</sup>	85.7 <sup>25</sup>	22.92 <sup>9</sup>	47.3 <sup>28</sup>
Oct. 7.0	18.67 <sup>1</sup>	58.6 <sup>34</sup>	21.04 <sup>4</sup>	19.9 <sup>8</sup>	4.78 <sup>3</sup>	83.0 <sup>27</sup>	22.95 <sup>3</sup>	44.5 <sup>28</sup>
17.0	18.74 <sup>7</sup> 15	55.0 <sup>36</sup> 36	21.13 <sup>9</sup> 12	18.8 <sup>11</sup> 13	4.85 <sup>7</sup> 13	80.0 <sup>30</sup> 31	23.11 <sup>16</sup> 29	41.8 <sup>27</sup> 26
26.9	18.89	51.4	21.25	17.5	4.98	76.9	23.40	39.2
Nov. 5.9	19.10 <sup>21</sup>	47.8 <sup>36</sup>	21.42 <sup>17</sup>	15.9 <sup>16</sup>	5.16 <sup>18</sup>	73.8 <sup>31</sup>	23.82 <sup>42</sup>	36.9 <sup>23</sup>
15.9	19.38 <sup>28</sup>	44.3 <sup>35</sup>	21.64 <sup>22</sup>	14.1 <sup>18</sup>	5.39 <sup>23</sup>	70.6 <sup>32</sup>	24.36 <sup>54</sup>	35.0 <sup>19</sup>
25.9	19.72 <sup>34</sup>	40.9 <sup>34</sup>	21.90 <sup>26</sup>	12.1 <sup>20</sup>	5.67 <sup>28</sup>	67.5 <sup>31</sup>	25.01 <sup>65</sup>	33.6 <sup>14</sup>
Dec. 5.8	20.13 <sup>41</sup> 45	37.9 <sup>30</sup> 27	22.18 <sup>28</sup> 32	10.0 <sup>21</sup> 22	5.99 <sup>32</sup> 36	64.6 <sup>29</sup> 28	25.74 <sup>73</sup> 79	32.8 <sup>8</sup> 3
15.8	20.58	35.2	22.50	7.8	6.35	61.8	26.53	32.5
25.8	21.06 <sup>48</sup>	33.0 <sup>22</sup>	22.83 <sup>33</sup>	5.5 <sup>23</sup>	6.73 <sup>38</sup>	59.4 <sup>24</sup>	27.36 <sup>83</sup>	32.9 <sup>4</sup>
35.7	21.57 <sup>51</sup>	31.3 <sup>17</sup>	23.17 <sup>34</sup>	3.3 <sup>22</sup>	7.12 <sup>39</sup>	57.4 <sup>20</sup>	28.20 <sup>84</sup>	33.9 <sup>10</sup>
Sec δ, Tan δ	1.808	+1.506	1.002	+0.067	1.283	+0.803	3.086	-2.919
Mean Place	17°.640	75''.62	19°.267	33''.00	3°.235	97''.95	24°.108	26''.22
D'ψ α, Dω α	-0.01	+0.10	0.00	0.00	0.00	+0.05	+0.02	-0.19
Dψ δ, Dω δ	-0.4	-0.2	-0.4	-0.2	-0.4	-0.2	-0.4	-0.2



FOR THE UPPER TRANSIT AT WASHINGTON.

m Solar Date.	ε Virginis. Mag. 3.0		θ Virginis. Mag. 4.4		43 Comæ. Mag. 4.3		20 Canum Venat. Mag. 4.7	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 12 57 s	° ' " + 11 24 "	h m 13 5 s	° ' " - 5 5 "	h m 13 7 s	° ' " + 28 17 "	h m 13 13 s	° ' " + 41 0 "
n. 0.8	57.25	46.0	33.18	12.9	55.08	75.2	44.66	51.6
10.7	57.60 35	43.9 21	33.52 34	15.0 21	55.44 36	73.2 20	45.06 40	49.7 19
20.7	57.93 33	42.0 19	33.86 34	17.1 21	55.80 36	71.6 16	45.46 40	48.3 14
30.7	58.25 32	40.5 15	34.17 31	19.1 20	56.14 34	70.5 11	45.84 38	47.5 8
b. 9.7	58.54 29 25	39.3 12 9	34.46 29 26	20.9 18 15	56.45 31 28	69.9 6 2	46.20 36 32	47.2 3 3
19.6	58.79	38.4	34.72	22.4	56.73	69.7	46.52	47.5
ar. 1.6	59.01 22	37.9 5	34.95 23	23.7 13	56.97 24	70.0 3	46.80 28	48.3 8
11.6	59.19 18	37.7 2	35.13 18	24.8 11	57.17 20	70.8 8	47.02 22	49.6 13
21.5	59.33 14	37.8 1	35.28 15	25.6 8	57.33 16	71.9 11	47.20 18	51.3 17
31.5	59.43 10 7	38.2 4 7	35.39 11 8	26.2 6 3	57.44 11 7	73.2 13 16	47.32 12 8	53.2 19 22
or. 10.5	59.50	38.9	35.47	26.5	57.51	74.8	47.40	55.4
20.5	59.53 3	39.7 8	35.52 5	26.7 2	57.54 3	76.6 18	47.43 3	57.7 23
30.4	59.54 1	40.7 10	35.55 3	26.6 1	57.54 0	78.4 18	47.42 1	60.0 23
ay 10.4	59.52 2	41.7 10	35.54 1	26.4 2	57.51 3	80.2 18	47.37 5	62.2 22
20.4	59.48 4 6	42.7 10 10	35.52 2 5	26.1 3 4	57.45 6 8	81.9 17 16	47.28 9 11	64.3 21 19
30.4	59.42 8	43.7 10	35.47 6	25.7 5	57.37 9	83.5 14	47.17 13	66.2 16
ne 9.3	59.34 8	44.7 8	35.41 7	25.2 5	57.28 12	84.9 11	47.04 16	67.8 12
19.3	59.26 10	45.5 8	35.34 9	24.7 6	57.16 12	86.0 9	46.88 16	69.0 9
29.3	59.16 10	46.3 6	35.25 10	24.1 6	57.04 13	86.9 6	46.72 18	69.9 5
ly 9.2	59.06 11	46.9 4	35.15 10	23.5 6	56.91 14	87.5 2	46.54 18	70.4 1
19.2	58.95 10	47.3 3	35.05 10	22.9 5	56.77 13	87.7 0	46.36 18	70.5 4
29.2	58.85 10	47.6 1	34.95 10	22.4 6	56.64 13	87.7 4	46.18 17	70.1 7
ig. 8.2	58.75 10	47.7 2	34.85 9	21.8 4	56.51 13	87.3 7	46.01 16	69.4 11
18.1	58.65 8	47.5 3	34.76 8	21.4 4	56.38 10	86.6 10	45.85 14	68.3 15
28.1	58.57 6	47.2 5	34.68 6	21.0 3	56.28 9	85.6 13	45.71 12	66.8 19
pt. 7.1	58.51 3	46.7 8	34.62 4	20.7 1	56.19 6	84.3 16	45.59 9	64.9 22
17.1	58.48 0	45.9 10	34.58 1	20.6 1	56.13 2	82.7 19	45.50 4	62.7 25
27.0	58.48 3	44.9 13	34.57 4	20.7 2	56.11 1	80.8 22	45.46 1	60.2 28
st. 7.0	58.51 8	43.6 15	34.61 7	20.9 5	56.12 6	78.6 24	45.45 4	57.4 30
17.0	58.59 12	42.1 18	34.68 12	21.4 8	56.18 10	76.2 26	45.49 10	54.4 32
26.9	58.71 16	40.3 20	34.80 16	22.2 11	56.28 15	73.6 27	45.59 15	51.2 32
ov. 5.9	58.87 21	38.3 21	34.96 21	23.3 13	56.43 20	70.9 29	45.74 21	48.0 33
15.9	59.08 25	36.2 23	35.17 25	24.6 15	56.63 25	68.0 28	45.95 26	44.7 33
25.9	59.33 29	33.9 24	35.42 29	26.1 18	56.88 29	65.2 29	46.21 31	41.4 31
ec. 5.8	59.62 31	31.5 24	35.71 31	27.9 20	57.17 32	62.3 26	46.52 34	38.3 28
15.8	59.93 33	29.1 23	36.02 33	29.9 21	57.49 35	59.7 25	46.86 38	35.5 26
25.8	60.26 34	26.8 22	36.35 34	32.0 21	57.84 36	57.2 22	47.24 39	32.9 21
35.8	60.60	24.6	36.69	34.1	58.20	55.0	47.63	30.8
δ, Tan δ	1.020	+0.202	1.004	-0.089	1.136	+0.538	1.325	+0.870
z Place	56°.741	56''.75	32°.829	7''.72	54°.514	91''.63	44°.057	71''.61
α, D <sub>α</sub> α	0.00	+0.01	0.00	-0.01	0.00	+0.03	-0.01	+0.06
β, D <sub>β</sub> β	-0.4	-0.2	-0.4	-0.3	-0.4	-0.3	-0.4	-0.3



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\gamma$ Hydræ. Mag. 3.3		$\iota$ Centauri. Mag. 2.9		$\epsilon^1$ Ursæ Majoris. (Mizar.) Mag. 2.4		$\alpha$ Virginis. (Spica.) Mag. 1.2	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 13 14 s	° ' " —22 43 "	h m 13 15 s	° ' " —36 15 "	h m 13 20 s	° ' " +55 21 "	h m 13 20 s	° ' " —10 43 "
Jan. 0.8	17.98	23.4	48.73	46.3	31.05	45.2	43.00	8.1
10.7	18.35 37	25.4 20	49.13 40	48.1 18	31.54 49	43.4 18	43.35 35	10.2 21
20.7	18.71 36	27.5 21	49.53 40	50.2 21	32.03 49	42.3 11	43.69 34	12.3 21
30.7	19.04 33	29.7 22	49.90 37	52.5 23	32.51 48	41.8 5	44.01 32	14.3 20
Feb. 9.7	19.35 31 28	31.9 22 22	50.25 35 31	54.9 24 25	32.95 44 40	42.0 2 7	44.31 30 27	16.2 19 17
19.6	19.63	34.1	50.56	57.4	33.35	42.7	44.58	17.9
Mar. 1.6	19.88 25	36.2 21	50.83 27	59.9 25	33.70 35	44.0 13	44.82 24	19.5 16
11.6	20.09 21	38.1 19	51.05 22	62.4 25	33.99 29	45.8 18	45.02 20	20.8 13
21.6	20.25 16	39.8 17	51.24 19	64.9 25	34.21 22	48.0 22	45.19 17	21.9 11
31.5	20.38 13 10	41.4 16 14	51.39 15 10	67.2 23 21	34.36 15 9	50.5 25 27	45.32 13 10	22.8 9 6
Apr. 10.5	20.48	42.8	51.49	69.3	34.45	53.2	45.42	23.4
20.5	20.55 7	44.0 12	51.56 7	71.2 19	34.47 2	56.0 28	45.49 7	23.9 5
30.4	20.58 3	44.9 9	51.60 4	73.0 18	34.43 4	58.7 27	45.52 3	24.2 3
May 10.4	20.59 1	45.7 8	51.60 0	74.5 15	34.33 10	61.3 26	45.53 1	24.3 1
20.4	20.57 2 4	46.3 6 4	51.57 3 5	75.7 12 10	34.19 14 18	63.7 24 20	45.52 1 3	24.2 1 2
30.4	20.53 6	46.7 1	51.52 8	76.7 8	34.01 22	65.7 17	45.49 5	24.0 2
June 9.3	20.47 8	46.8 0	51.44 10	77.5 4	33.79 24	67.4 13	45.44 7	23.8 4
19.3	20.39 9	46.8 2	51.34 12	77.9 1	33.55 26	68.7 9	45.37 8	23.4 5
29.3	20.30 11	46.6 4	51.22 13	78.0 2	33.29 28	69.6 4	45.29 10	22.9 5
July 9.3	20.19 11	46.2 6	51.09 15	77.8 4	33.01 27	70.0 1	45.19 10	22.4 6
19.2	20.08 12	45.6 7	50.94 15	77.4 7	32.74 28	69.9 6	45.09 11	21.8 6
29.2	19.96 12	44.9 8	50.79 15	76.7 10	32.46 27	69.3 11	44.98 11	21.2 6
Aug. 8.2	19.84 11	44.1 10	50.64 14	75.7 12	32.19 25	68.2 15	44.87 10	20.6 6
18.1	19.73 10	43.1 10	50.50 12	74.5 14	31.94 22	66.7 20	44.77 9	20.0 6
28.1	19.63 8	42.1 10	50.38 10	73.1 15	31.72 19	64.7 23	44.68 8	19.4 5
Sept. 7.1	19.55 5	41.1 10	50.28 7	71.6 16	31.53 15	62.4 27	44.60 5	18.9 4
17.1	19.50 1	40.1 9	50.21 2	70.0 16	31.38 10	59.7 31	44.55 2	18.5 3
27.0	19.49 2	39.2 8	50.19 2	68.4 15	31.28 5	56.6 33	44.53 2	18.2 1
Oct. 7.0	19.51 7	38.4 6	50.21 7	66.9 13	31.23 2	53.3 35	44.55 6	18.1 2
17.0	19.58 12	37.8 3	50.28 13	65.6 11	31.25 8	49.8 36	44.61 11	18.3 4
27.0	19.70 17	37.5 0	50.41 19	64.5 8	31.33 15	46.2 36	44.72 15	18.7 7
Nov. 5.9	19.87 22	37.5 3	50.60 24	63.7 5	31.48 23	42.6 37	44.87 20	19.4 9
15.9	20.09 27	37.8 6	50.84 29	63.2 0	31.71 29	38.9 35	45.07 25	20.3 13
25.9	20.36 30	38.4 10	51.13 34	63.2 3	32.00 35	35.4 32	45.32 28	21.6 15
Dec. 5.8	20.66 33	39.4 14	51.47 37	63.5 8	32.35 41	32.2 30	45.60 31	23.1 17
15.8	20.99 36	40.8 16	51.84 39	64.3 12	32.76 45	29.2 25	45.91 33	24.8 19
25.8	21.35 36	42.4 18	52.23 40	65.5 16	33.21 48	26.7 21	46.24 34	26.7 20
35.8	21.71 36	44.2	52.63	67.1	33.69	24.6	46.58	28.7
Sec $\delta$ , Tan $\delta$	1.084	—0.419	1.240	—0.734	1.759	+1.448	1.018	—0.189
Mean Place	17°.827	24''.10	48°.741	51''.30	30°.405	68''.38	42°.776	4''.50
D' $\psi$ $\alpha$ , D $\omega$ $\alpha$	0.00	—0.03	+0.01	—0.05	—0.01	+0.09	0.00	—0.01
D $\psi$ $\delta$ , D $\omega$ $\delta$	—0.4	—0.3	—0.4	—0.3	—0.4	—0.3	—0.4	—0.3

[Eph 15]

**FOR THE UPPER TRANSIT AT WASHINGTON.**

FOR THE UPPER TRANSIT AT WASHINGTON.

~~WILSON~~

FOR THE UPPER TRANSIT AT WASHINGTON.

Solar date.	$\eta$ Ursæ Majoris. (Alkaid.) Mag. 1.9		$\delta$ Virginis. Mag. 5.1		$\zeta$ Centauri. Mag. 3.1		$\eta$ Boötis. Mag. 2.8	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 13 44 s	° ' " +49 43 "	h m 13 45 s	° ' " -17 42 "	h m 13 50 s	° ' " -46 52 "	h m 13 50 s	° ' " +18 48 "
0.8	11.95	51.3	15.01	42.0	13.36	7.2	38.47	70.0
10.8	12.38 43	49.3 20	15.37 36	43.9 19	13.82 46	8.4 12	38.81 34	67.7 23
20.7	12.82 44	47.8 15	15.72 35	45.8 19	14.28 46	9.9 15	39.15 34	65.8 19
30.7	13.26 44	46.9 9	16.06 34	47.8 20	14.72 44	11.8 19	39.49 34	64.2 16
9.7	13.67 41 38	46.6 3 4	16.38 32 29	49.8 20 19	15.14 42 39	14.0 22 24	39.81 32 29	63.0 12 7
19.7	14.05	47.0	16.67	51.7	15.53	16.4	40.10	62.3
1.6	14.39 34	47.9 9	16.93 26	53.4 17	15.88 35	18.9 25	40.36 26	62.0 3
11.6	14.68 29	49.3 14	17.16 23	55.0 16	16.18 30	21.5 26	40.59 23	62.1 1
21.6	14.91 23	51.2 19	17.36 20	56.4 14	16.44 26	24.2 27	40.78 19	62.6 5
31.6	15.08 17 12	53.5 23 25	17.52 16 13	57.6 12 10	16.66 22 17	26.8 26 26	40.93 15 12	63.4 8 11
10.5	15.20	56.0	17.65	58.6	16.83	29.4	41.05	64.5
20.5	15.26 6	58.6 26	17.74 9	59.5 9	16.96 13	31.8 24	41.14 9	65.8 13
30.5	15.27 1	61.3 27	17.81 7	60.1 6	17.04 8	34.1 23	41.19 5	67.3 15
10.4	15.23 4	63.9 26	17.84 3	60.6 5	17.09 5	36.2 21	41.21 2	68.8 15
20.4	15.14 9 12	66.4 25 22	17.85 1 1	60.9 3 2	17.09 0 3	38.1 19 16	41.20 1 3	70.3 15 15
30.4	15.02	68.6	17.84	61.1	17.06	39.7	41.17	71.8
9.4	14.86 16	70.5 19	17.81 3	61.1 0	16.99 7	41.0 13	41.12 5	73.2 14
19.3	14.68 18	72.1 16	17.75 6	61.0 1	16.88 11	42.0 10	41.04 8	74.4 12
29.3	14.47 21	73.2 11	17.67 8	60.7 3	16.75 13	42.7 7	40.95 9	75.4 10
y 9.3	14.24 23 24	74.0 8 3	17.58 9 11	60.4 3 5	16.59 16 18	43.1 4 1	40.84 11 12	76.3 9 6
19.3	14.00	74.3	17.47	59.9	16.41	43.0	40.72	76.9
29.2	13.76 24	74.1 2	17.36 11	59.3 6	16.22 19	42.6 4	40.60 12	77.2 3
g. 8.2	13.52 24	73.4 7	17.24 12	58.6 7	16.02 20	41.9 7	40.47 13	77.3 1
18.2	13.29 23	72.3 11	17.12 12	57.9 7	15.82 20	40.9 10	40.34 13	77.1 2
28.1	13.08 21 19	70.7 16 19	17.01 11 10	57.2 7 7	15.64 18 16	39.5 14 16	40.22 12 11	76.6 5 7
pt. 7.1	12.89	68.8	16.91	56.5	15.48	37.9	40.11	75.9
17.1	12.73 16	66.4 24	16.83 8	55.8 7	15.35 13	36.1 18	40.02 9	74.9 10
27.1	12.61 12	63.7 27	16.79 4	55.1 7	15.27 8	34.2 19	39.96 6	73.6 13
t. 7.0	12.54 7	60.7 30	16.78 1	54.6 5	15.24 3	32.3 19	39.93 3	72.0 16
17.0	12.52 2 5	57.5 32 35	16.82 4 8	54.3 3 0	15.27 3 10	30.4 19 17	39.95 2 6	70.1 19 21
27.0	12.57	54.0	16.90	54.3	15.37	28.7	40.01	68.0
ov. 6.0	12.68 11	50.5 35	17.04 14	54.5 2	15.54 17	27.2 15	40.12 11	65.7 23
15.9	12.85 17	46.9 36	17.22 18	54.9 4	15.77 23	25.9 13	40.27 15	63.2 25
25.9	13.09 24	43.4 35	17.45 23	55.7 8	16.07 30	25.1 8	40.48 21	60.6 26
ec. 5.9	13.38 29 35	40.0 34 31	17.73 28 31	56.8 11 13	16.42 35 40	24.7 4 0	40.73 25 28	57.9 27 26
15.8	13.73	36.9	18.04	58.1	16.82	24.7	41.01	55.3
25.8	14.12 39	34.1 28	18.37 33	59.7 16	17.26 44	25.1 4	41.33 32	52.8 25
35.8	14.54 42	31.8 23	18.72 35	61.4 17	17.71 45	26.0 9	41.66 33	50.4 24
$\delta$ , Tan $\delta$ an Place	1.547 11 <sup>h</sup> .605	+1.181 73 <sup>''</sup> .63	1.050 14 <sup>h</sup> .978	-0.319 40 <sup>''</sup> .10	1.463 13 <sup>h</sup> .771	-1.068 13 <sup>''</sup> .73	1.056 38 <sup>h</sup> .254	+0.341 84 <sup>''</sup> .20
$\delta$ , D <sub>00</sub> $\delta$	-0.01	+0.07	0.00	-0.02	+0.01	-0.06	0.00	+0.02
$\delta$ , D <sub>00</sub> $\delta$	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.4	-0.5

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\theta$ Apodis. Var. 5.5-6.6		$\tau$ Virginis. Mag. 4.3		11 Boötis. Mag. 6.1		$\beta$ Centauri. Mag. 0.9	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 13 56 s	° ' " -76 23 "	h m 13 57 s	° ' " + 1 56 "	h m 13 57 s	° ' " + 27 47 "	h m 13 57 s	° ' " -59 57 "
Jan. 0.8	57.52	2.2	19.27	70.7	19.48	31.0	47.91	39.4
10.8	58.65 <sup>113</sup>	2.5 3	19.60 33	68.6 <sup>21</sup>	19.83 <sup>35</sup>	28.7 <sup>23</sup>	48.50 <sup>59</sup>	40.2 <sup>8</sup>
20.7	59.79 <sup>114</sup>	3.4 9	19.93 33	66.6 <sup>20</sup>	20.19 <sup>36</sup>	26.9 <sup>18</sup>	49.09 <sup>59</sup>	41.4 <sup>12</sup>
30.7	60.90 <sup>111</sup>	4.8 <sup>14</sup>	20.26 33	64.8 <sup>18</sup>	20.54 <sup>35</sup>	25.4 <sup>15</sup>	49.67 <sup>58</sup>	43.1 <sup>17</sup>
Feb. 9.7	61.97 <sup>107</sup>	6.8 <sup>20</sup>	20.57 <sup>31</sup>	63.2 <sup>16</sup>	20.87 <sup>33</sup>	24.4 <sup>10</sup>	50.22 <sup>55</sup>	45.2 <sup>21</sup>
	99	23	29	13	31	5	51	23
19.7	62.96	9.1	20.86	61.9	21.18	23.9	50.73	47.5
Mar. 1.6	63.86 <sup>90</sup>	11.9 <sup>28</sup>	21.12 <sup>26</sup>	61.0 9	21.46 <sup>28</sup>	24.0 1	51.19 <sup>46</sup>	50.2 <sup>27</sup>
11.6	64.66 <sup>80</sup>	14.9 <sup>30</sup>	21.35 <sup>23</sup>	60.3 7	21.70 <sup>24</sup>	24.4 4	51.60 <sup>41</sup>	53.0 <sup>28</sup>
21.6	65.33 <sup>67</sup>	18.2 <sup>33</sup>	21.55 <sup>20</sup>	59.9 4	21.90 <sup>20</sup>	25.4 <sup>10</sup>	51.95 <sup>35</sup>	56.0 <sup>30</sup>
31.6	65.88 <sup>55</sup>	21.6 <sup>34</sup>	21.71 <sup>16</sup>	59.8 1	22.07 <sup>17</sup>	26.7 <sup>13</sup>	52.24 <sup>29</sup>	59.1 <sup>31</sup>
	42	35	13	2	12	15	23	30
Apr. 10.5	66.30	25.1	21.84	60.0	22.19	28.2	52.47	62.1
20.5	66.59 <sup>29</sup>	28.6 <sup>35</sup>	21.93 9	60.4 4	22.28 9	30.0 <sup>18</sup>	52.64 <sup>17</sup>	65.1 <sup>30</sup>
30.5	66.74 <sup>15</sup>	32.0 <sup>34</sup>	22.00 7	60.9 5	22.33 5	31.9 <sup>19</sup>	52.75 <sup>11</sup>	68.0 <sup>29</sup>
May 10.4	66.76 <sup>2</sup>	35.3 <sup>33</sup>	22.04 4	61.6 7	22.35 <sup>2</sup>	33.9 <sup>20</sup>	52.80 <sup>5</sup>	70.7 <sup>27</sup>
20.4	66.65 <sup>11</sup>	38.4 <sup>31</sup>	22.06 <sup>2</sup>	62.3 7	22.34 <sup>1</sup>	35.8 <sup>19</sup>	52.80 <sup>0</sup>	73.2 <sup>25</sup>
	24	29	1	9	4	18	7	22
30.4	66.41	41.3	22.05	63.2	22.30	37.6	52.73	75.4
June 9.4	66.04 <sup>37</sup>	43.8 <sup>25</sup>	22.02 3	64.0 8	22.23 7	39.3 <sup>17</sup>	52.62 <sup>11</sup>	77.3 <sup>19</sup>
19.3	65.58 <sup>46</sup>	45.9 <sup>21</sup>	21.96 6	64.8 8	22.14 9	40.8 <sup>15</sup>	52.45 <sup>17</sup>	78.9 <sup>16</sup>
29.3	65.01 <sup>57</sup>	47.6 <sup>17</sup>	21.89 7	65.5 7	22.03 <sup>11</sup>	42.0 <sup>12</sup>	52.24 <sup>21</sup>	80.1 <sup>12</sup>
July 9.3	64.37 <sup>64</sup>	48.8 <sup>12</sup>	21.80 9	66.2 7	21.91 <sup>12</sup>	42.9 9	51.99 <sup>25</sup>	80.8 <sup>7</sup>
	70	7	10	6	14	6	27	3
19.3	63.67	49.5	21.70	66.8	21.77	43.5	51.72	81.1
29.2	62.93 <sup>74</sup>	49.6 1	21.59 <sup>11</sup>	67.4 6	21.62 <sup>15</sup>	43.8 3	51.42 <sup>30</sup>	81.0 <sup>1</sup>
Aug. 8.2	62.18 <sup>75</sup>	49.2 4	21.47 <sup>12</sup>	67.8 4	21.47 <sup>15</sup>	43.8 0	51.12 <sup>30</sup>	80.4 <sup>6</sup>
18.2	61.45 <sup>73</sup>	48.3 9	21.36 <sup>11</sup>	68.0 2	21.32 <sup>15</sup>	43.4 4	50.82 <sup>30</sup>	79.4 <sup>10</sup>
28.1	60.77 <sup>68</sup>	46.9 <sup>14</sup>	21.24 <sup>12</sup>	68.2 2	21.18 <sup>14</sup>	42.7 7	50.54 <sup>28</sup>	78.0 <sup>14</sup>
	61	19	10	0	13	11	25	18
Sept. 7.1	60.16	45.0	21.14	68.2	21.05	41.6	50.29	76.2
17.1	59.66 <sup>50</sup>	42.7 <sup>23</sup>	21.06 8	68.0 2	20.95 <sup>10</sup>	40.2 <sup>14</sup>	50.08 <sup>21</sup>	74.2 <sup>20</sup>
27.1	59.29 <sup>37</sup>	40.1 <sup>26</sup>	21.01 5	67.5 5	20.87 8	38.5 <sup>17</sup>	49.94 <sup>14</sup>	71.9 <sup>23</sup>
Oct. 7.0	59.08 <sup>21</sup>	37.3 <sup>28</sup>	20.99 2	66.9 6	20.83 4	36.5 <sup>20</sup>	49.87 <sup>7</sup>	69.5 <sup>24</sup>
17.0	59.04 <sup>4</sup>	34.4 <sup>29</sup>	21.01 <sup>2</sup>	66.0 9	20.82 <sup>1</sup>	34.2 <sup>23</sup>	49.88 <sup>1</sup>	67.1 <sup>24</sup>
	14	29	6	11	5	25	10	23
27.0	59.18	31.5	21.07	64.9	20.87	31.7	49.98	64.8
Nov. 6.0	59.51 <sup>33</sup>	28.7 <sup>28</sup>	21.18 <sup>11</sup>	63.6 <sup>13</sup>	20.97 <sup>10</sup>	29.0 <sup>27</sup>	50.17 <sup>19</sup>	62.6 <sup>22</sup>
15.9	60.02 <sup>51</sup>	26.2 <sup>25</sup>	21.34 <sup>16</sup>	62.0 <sup>16</sup>	21.12 <sup>15</sup>	26.1 <sup>29</sup>	50.46 <sup>29</sup>	60.7 <sup>19</sup>
25.9	60.71 <sup>69</sup>	24.1 <sup>21</sup>	21.54 <sup>20</sup>	60.2 <sup>18</sup>	21.32 <sup>20</sup>	23.1 <sup>30</sup>	50.82 <sup>36</sup>	59.1 <sup>16</sup>
Dec. 5.9	61.54 <sup>83</sup>	22.3 <sup>18</sup>	21.79 <sup>25</sup>	58.2 <sup>20</sup>	21.56 <sup>24</sup>	20.2 <sup>29</sup>	51.26 <sup>44</sup>	58.0 <sup>11</sup>
	95	12	28	20	29	29	51	6
15.8	62.49	21.1	22.07	56.2	21.85	17.3	51.77	57.4
25.8	63.54 <sup>105</sup>	20.4 7	22.38 <sup>31</sup>	54.0 <sup>22</sup>	22.17 <sup>32</sup>	14.6 <sup>27</sup>	52.32 <sup>55</sup>	57.3 <sup>1</sup>
35.8	64.65 <sup>111</sup>	20.3 1	22.70 <sup>32</sup>	51.9 <sup>21</sup>	22.51 <sup>34</sup>	12.1 <sup>25</sup>	52.90 <sup>58</sup>	57.7 <sup>4</sup>
Sec $\delta$ , Tan $\delta$	4.250	-4.130	1.001	+0.034	1.130	+0.527	1.998	-1.730
Mean Place	60°.213	13''.79	19°.165	79''.56	19°.286	47''.97	48°.819	48''.55
D' $\psi$ $\alpha$ , D $\omega$ $\alpha$	+0.05	-0.24	0.00	0.00	-0.01	+0.03	+0.02	-0.10
D $\psi$ $\delta$ , D $\omega$ $\delta$	-0.3	-0.5	-0.3	-0.5	-0.3	-0.5	-0.3	-0.5

FOR THE UPPER TRANSIT AT WASHINGTON.

Solar Date.	$\pi$ Hydræ. Mag. 3.5		$\theta$ Centauri. Mag. 2.3		$\alpha$ Draconis. Mag. 3.6		$\delta$ Boötis. Mag. 4.8	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 14 1 s	° ' " — 26 16 "	h m 14 1 s	° ' " — 35 57 "	h m 14 2 s	° ' " + 64 46 "	h m 14 6 s	° ' " + 25 29 "
l. 0.8	31.49	24.0	40.21	5.0	5.33	29.8	31.51	21.2
10.8	31.86 37	25.6 16	40.61 40	6.4 14	5.91 58	27.8 20	31.86 35	18.9 23
20.8	32.23 37	27.4 18	41.01 40	8.0 16	6.51 60	26.4 14	32.21 35	17.0 19
30.7	32.59 36	29.2 18	41.41 40	9.9 19	7.11 60	25.7 7	32.55 34	15.4 16
b. 9.7	32.93 34 32	31.2 20 20	41.78 37 34	11.9 20 22	7.70 59 55	25.6 1 6	32.88 33 31	14.3 11 6
19.7	33.25	33.2	42.12	14.1	8.25	26.2	33.19	13.7
r. 1.6	33.54 29	35.1 19	42.43 31	16.3 22	8.74 49	27.4 12	33.47 28	13.6 1
11.6	33.80 26	37.0 19	42.71 28	18.5 22	9.16 42	29.2 18	33.72 25	14.0 4
21.6	34.02 22	38.8 18	42.95 24	20.7 22	9.51 35	31.4 22	33.93 21	14.8 8
31.6	34.21 19 15	40.4 16 14	43.16 21 16	22.8 21 20	9.77 26 17	34.0 26 29	34.11 18 13	15.9 11 15
r. 10.5	34.36	41.8	43.32	24.8	9.94	36.9	34.24	17.4
20.5	34.48 12	43.1 13	43.45 13	26.6 18	10.02 8	39.9 30	34.34 10	19.0 16
30.5	34.57 9	44.3 12	43.54 9	28.3 17	10.02 0	42.9 30	34.40 6	20.9 19
y 10.5	34.63 6	45.3 10	43.60 6	29.9 16	9.94 8	45.8 29	34.43 3	22.8 19
20.4	34.65 2 0	46.1 8 6	43.63 3 1	31.2 13 11	9.78 16 23	48.6 28 25	34.43 0 3	24.6 18 18
30.4	34.65	46.7	43.62	32.3	9.55	51.1	34.40	26.4
me 9.4	34.62 3	47.1 4	43.58 4	33.2 9	9.27 28	53.2 21	34.35 5	28.1 17
19.3	34.57 5	47.3 2	43.51 7	33.9 7	8.94 33	55.0 18	34.27 8	29.6 15
29.3	34.49 8	47.4 1	43.42 9	34.3 4	8.56 38	56.2 12	34.17 10	30.8 12
uly 9.3	34.40 9 12	47.3 1 3	43.30 12 13	34.4 1 1	8.15 41 42	57.0 8 2	34.05 12 13	31.8 10 7
19.3	34.28	47.0	43.17	34.3	7.73	57.2	33.92	32.5
29.2	34.15 13	46.5 5	43.02 15	33.9 4	7.30 43	57.0 2	33.77 15	32.9 4
ug. 8.2	34.02 13	45.8 7	42.86 16	33.3 6	6.86 44	56.2 8	33.62 15	33.0 1
18.2	33.88 14	45.1 7	42.70 16	32.4 9	6.44 42	54.9 13	33.48 14	32.7 3
28.2	33.75 13 11	44.2 9 10	42.55 15 14	31.3 11 12	6.05 39 36	53.2 17 23	33.33 15 13	32.1 6 9
pt. 7.1	33.64	43.2	42.41	30.1	5.69	50.9	33.20	31.2
17.1	33.54 10	42.2 10	42.30 11	28.7 14	5.37 32	48.3 26	33.09 11	30.0 12
27.1	33.48 6	41.2 10	42.23 7	27.3 14	5.11 26	45.3 30	33.01 8	28.4 16
st. 7.0	33.46 2	40.2 10	42.20 3	25.9 14	4.92 19	42.0 33	32.96 5	26.5 19
17.0	33.48 2 7	39.4 8 6	42.22 2 7	24.6 13 12	4.81 11 3	38.4 36 37	32.95 1 4	24.4 21 24
27.0	33.55	38.8	42.29	23.4	4.78	34.7	32.99	22.0
ov. 6.0	33.68 13	38.4 4	42.42 13	22.5 9	4.84 6	30.8 39	33.08 9	19.4 26
15.9	33.86 18	38.3 1	42.62 20	21.8 7	5.01 17	27.0 38	33.22 14	16.6 28
25.9	34.09 23	38.6 3	42.87 25	21.5 3	5.26 25	23.2 38	33.40 18	13.7 29
ec. 5.9	34.36 27 32	39.1 5 8	43.17 30 34	21.5 0 4	5.60 34 43	19.7 35 32	33.64 24 28	10.8 29 29
15.9	34.68	39.9	43.51	21.9	6.03	16.5	33.92	7.9
25.8	35.02 34	41.1 12	43.88 37	22.7 8	6.52 49	13.6 29	34.23 31	5.2 27
35.8	35.38 36	42.5 14	44.27 39	23.8 11	7.07 55	11.3 23	34.56 33	2.7 25
$\delta$ , Tan $\delta$ in Place	1.115 31°.624	—0.494 24'' .30	1.235 40°.478	—0.725 8'' .32	2.347 5°.304	+2.123 54'' .53	1.108 31°.390	+0.477 37'' .59
$a$ , $D_{\infty} a$	+0.01	—0.03	+0.01	—0.04	—0.03	+0.12	—0.01	+0.03
$b$ , $D_{\infty} b$	—0.3	—0.5	—0.3	—0.5	—0.3	—0.5	—0.3	—0.5

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date	
<hr/>	
Jan.	0.8
	10.8
	20.8
	30.7
Feb.	9.7
	19.7
Mar.	1.6
	11.6
	21.6
	31.6
Apr.	10.5
	20.5
	30.5
May	10.5
	20.4
	30.4
June	9.4
	19.3
	29.3
July	9.3
	19.3
	29.2
Aug.	8.2
	18.2
	28.2
Sept.	7.1
	17.1
	27.1
Oct.	7.0
	17.0
	27.0
Nov.	6.0
	15.9
	25.9
Dec.	5.9
	15.9
	25.8
	35.8
<hr/>	
Sec $\delta$ , Tan $\delta$	
Mean Place	
<hr/>	
D' $\alpha$ , D <sub>0</sub> $\alpha$	
D' $\delta$ , D <sub>0</sub> $\delta$	

FOR THE UPPER TRANSIT AT WASHINGTON.

Sun Solar Date.	λ Boötis. Mag. 4.3		λ Virginis. Mag. 4.6		♌ Libræ. Mag. 6.3		θ Boötis. Mag. 4.1	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 14 13 s	° ' +46 28 "	h m 14 14 s	° ' -12 58 "	h m 14 18 s	° ' -11 19 "	h m 14 22 s	° ' +52 13 "
a. 0.8	9.28	19.9	30.35	53.7	50.94	39.7	18.14	73.0
10.8	9.68 40	17.6 23	30.69 34	55.5 18	51.28 34	41.6 19	18.57 43	70.6 24
20.8	10.10 42	15.8 18	31.04 35	57.3 18	51.62 34	43.4 18	19.02 45	68.8 18
30.7	10.51 41	14.5 13	31.38 34	59.1 18	51.96 34	45.2 18	19.47 45	67.6 12
b. 9.7	10.91 40 38	13.9 6 0	31.70 32 31	60.9 18 16	52.28 32 31	47.0 18 16	19.91 44 42	66.9 7 1
19.7	11.29	13.9	32.01	62.5	52.59	48.6	20.33	67.0
r. 1.7	11.64 35	14.4 5	32.28 27	64.0 15	52.87 28	50.0 14	20.71 38	67.6 6
11.6	11.94 30	15.6 12	32.53 25	65.3 13	53.12 25	51.2 12	21.05 34	68.8 12
21.6	12.19 25	17.2 16	32.75 22	66.4 11	53.34 22	52.2 10	21.34 29	70.6 18
31.6	12.40 21 15	19.2 20 24	32.94 19 15	67.2 8 7	53.52 18 16	52.9 7 6	21.57 23 17	72.8 22 25
r. 10.5	12.55	21.6	33.09	67.9	53.68	53.5	21.74	75.3
20.5	12.66 11	24.1 25	33.21 12	68.4 5	53.81 13	53.9 4	21.86 12	78.0 27
30.5	12.71 5	26.8 27	33.31 10	68.7 3	53.91 10	54.1 2	21.92 6	80.8 28
ly 10.5	12.71 0	29.5 27	33.37 6	68.9 2	53.98 7	54.1 0	21.92 0	83.6 28
20.4	12.67 4 8	32.1 26 24	33.41 4 1	68.9 0 1	54.02 4 1	54.0 1 1	21.87 5 9	86.4 28 25
30.4	12.59	34.5	33.42	68.8	54.03	53.9	21.78	88.9
ne 9.4	12.48 11	36.6 21	33.41 1	68.6 2	54.02 1	53.6 3	21.64 14	91.2 23
19.4	12.33 15	38.5 19	33.37 4	68.3 3	53.98 4	53.3 3	21.46 18	93.2 20
29.3	12.15 18	40.0 15	33.31 6	68.0 3	53.93 5	52.9 4	21.25 21	94.7 15
ly 9.3	11.95 20 22	41.0 10 7	33.23 8 10	67.6 4 5	53.85 8 10	52.4 5 5	21.01 24 26	95.9 12 7
19.3	11.73	41.7	33.13	67.1	53.75	51.9	20.75	96.6
29.2	11.51 22	41.8 1	33.01 12	66.6 5	53.64 11	51.4 5	20.48 27	96.8 2
ug. 8.2	11.27 24	41.6 2	32.89 12	66.0 6	53.52 12	50.9 5	20.20 28	96.5 3
18.2	11.04 23	40.9 7	32.76 13	65.5 5	53.39 13	50.4 5	19.92 28	95.7 8
28.2	10.82 22 21	39.7 12 16	32.64 12 11	64.9 6 5	53.27 12 12	49.9 5 5	19.65 27 25	94.5 12 17
pt. 7.1	10.61	38.1	32.53	64.4	53.15	49.4	19.40	92.8
17.1	10.44 17	36.2 19	32.44 9	63.9 5	53.06 9	49.0 4	19.17 23	90.7 21
27.1	10.29 15	33.8 24	32.37 7	63.6 3	52.99 7	48.7 3	18.98 19	88.2 25
t. 7.1	10.19 10	31.0 28	32.34 3	63.4 2	52.95 4	48.6 1	18.84 14	85.3 29
17.0	10.13 6 0	28.0 30 32	32.34 0 6	63.4 0 1	52.95 0 5	48.7 1 3	18.76 8 3	82.2 31 34
27.0	10.13	24.8	32.40	63.5	53.00	49.0	18.73	78.8
iv. 6.0	10.20 7	21.3 35	32.50 10	63.9 4	53.09 9	49.4 4	18.77 4	75.2 36
15.9	10.32 12	17.8 35	32.65 15	64.6 7	53.24 15	50.2 8	18.88 11	71.5 37
25.9	10.51 19	14.3 35	32.85 20	65.5 9	53.43 19	51.2 10	19.06 18	67.8 37
xc. 5.9	10.76 25 30	10.8 35 32	33.10 25 28	66.6 11 14	53.67 24 28	52.4 12 15	19.31 25 31	64.2 36 34
15.9	11.06	7.6	33.38	68.0	53.95	53.9	19.62	60.8
25.8	11.41 35	4.6 30	33.69 31	69.6 16	54.26 31	55.5 16	19.98 36	57.8 30
35.8	11.80 39	2.0 26	34.02 33	71.3 17	54.59 33	57.3 18	20.39 41	55.1 27
δ, Tan δ n Place	1.452 9°.239	+1.053 41''.47	1.026 30°.430	-0.231 49''.37	1.020 51°.030	-0.200 34''.81	1.633 18°.243	+1.291 95''.61
α, D <sub>α</sub> α	-0.02	+0.06	0.00	-0.01	0.00	-0.01	-0.02	+0.07
δ, D <sub>δ</sub> δ	-0.3	-0.5	-0.3	-0.6	-0.3	-0.6	-0.3	-0.6





FOR THE UPPER TRANSIT AT WASHINGTON.

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	33 Boötis. Mag. 5.4		α Apodis. Mag. 3.8		μ Virginis. Mag. 4.0		ε Boötis. Mag. 2.7	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 14 35 s	° ' +44 45 "	h m 14 37 s	° ' -78 40 "	h m 14 38 s	° ' - 5 17 "	h m 14 41 s	° ' +27 25 "
Jan. 0.8	40.34	53.9	10.33	56.8	34.58	28.5	16.37	38.3
10.8	40.72 38	51.4 25	11.64 131	56.5 3	34.90 32	30.4 19	16.70 33	35.8 25
20.8	41.11 39	49.3 21	13.00 136	56.7 2	35.24 34	32.3 19	17.05 35	33.7 21
30.7	41.52 41	47.8 15	14.37 137	57.4 7	35.57 33	34.1 18	17.40 35	32.0 17
Feb. 9.7	41.91 39 38	46.9 9 2	15.72 135 129	58.7 13 17	35.89 32 31	35.7 16 14	17.74 34 32	30.7 13 7
19.7	42.29	46.7	17.01	60.4	36.20	37.1	18.06	30.0
Mar. 1.7	42.64 35	47.0 3	18.21 120	62.6 22	36.49 29	38.3 12	18.36 30	29.8 2
11.6	42.96 32	47.9 9	19.32 111	65.2 26	36.75 26	39.2 9	18.64 28	30.1 3
21.6	43.23 27	49.3 14	20.31 99	68.0 28	36.98 23	39.9 7	18.88 24	30.8 7
31.6	43.46 23 18	51.2 19 22	21.16 85 70	71.1 31 33	37.18 20 17	40.3 4 2	19.09 21 17	32.0 12 15
Apr. 10.6	43.64	53.4	21.86	74.4	37.35	40.5	19.26	33.5
20.5	43.77 13	55.9 25	22.41 55	77.8 34	37.50 15	40.5 0	19.39 13	35.3 18
30.5	43.85 8	58.6 27	22.79 38	81.2 34	37.61 11	40.3 2	19.49 10	37.3 20
May 10.5	43.88 3	61.3 27	23.01 22	84.6 34	37.69 8	39.9 4	19.55 6	39.4 21
20.4	43.88 0 5	63.9 26 25	23.06 5 11	87.8 32 31	37.75 6 3	39.9 4 5	19.58 3 0	41.5 21 20
30.4	43.83	66.4	22.95	90.9	37.78	39.0	19.58	43.5
June 9.4	43.74 9	68.7 23	22.68 27	93.7 28	37.78 0	38.4 6	19.54 4	45.4 19
19.4	43.62 12	70.8 21	22.25 43	96.2 25	37.76 2	37.8 6	19.48 6	47.2 18
29.3	43.46 16	72.5 17	21.69 56	98.3 21	37.71 5	37.2 6	19.39 9	48.7 15
July 9.3	43.28 18 20	73.8 13 9	21.00 69 79	100.0 17 12	37.64 7 9	36.6 6 6	19.39 11 13	48.7 13 10
19.3	43.08	74.7	20.21	101.2	37.55	36.0	19.15	51.0
29.3	42.86 22	75.1 4	19.35 86	101.9 7	37.44 11	35.5 5	19.00 15	51.6 6
Aug. 8.2	42.63 23	75.2 1	18.44 91	102.0 1	37.32 12	35.0 5	18.84 16	51.6 3
18.2	42.40 23	74.7 5	17.51 93	101.6 4	37.19 13	34.6 4	18.68 16	51.9 1
28.2	42.17 23 22	73.8 9 13	16.61 90 83	100.7 9 15	37.06 13 12	34.2 4 2	18.51 17 16	51.8 4 7
Sept. 7.1	41.95	72.5	15.78	99.2	36.94	34.0	18.35	50.7
17.1	41.75 20	70.8 17	15.04 74	97.3 19	36.83 11	33.9 1	18.21 14	49.6 11
27.1	41.58 17	68.6 22	14.44 60	95.0 23	36.74 9	33.9 0	18.09 12	48.1 15
Oct. 7.1	41.46 12	66.1 25	14.00 44	92.4 26	36.69 5	34.1 2	18.00 9	46.3 18
17.0	41.38 8 3	63.2 29 31	13.76 24 3	89.5 29 29	36.67 2 2	34.5 4 6	17.95 5 1	44.2 21 24
27.0	41.35	60.1	13.73	86.6	36.69	35.1	17.94	41.8
Nov. 6.0	41.38 3	56.8 33	13.92 19	83.6 30	36.77 8	35.9 8	17.99 5	39.2 26
16.0	41.48 10	53.3 35	14.34 42	80.8 28	36.89 12	37.0 11	18.09 10	36.4 28
25.9	41.63 15	49.8 35	14.98 64	78.3 25	37.06 17	38.3 13	18.24 15	33.4 30
Dec. 5.9	41.85 22 27	46.3 35 33	15.82 84 101	76.1 22 18	37.28 22 26	39.8 15 16	18.44 20 25	30.4 30 29
15.9	42.12	43.0	16.83	74.3	37.54	41.4	18.69	27.5
25.8	42.44 32	39.9 31	17.98 115	73.0 13	37.83 29	43.2 18	18.97 28	24.7 27
35.8	42.80 36	37.1 28	19.25 127	72.2 8	38.14 31	45.1 19	19.29 32	22.0 27
Sec δ, Tan δ	1.408	+0.992	5.098	-4.999	1.004	-0.093	1.127	+0.519
Mean Place	40°.501	74''.81	14°.370	66''.42	34°.732	21''.29	16°.494	55''.12
D'ψ a, Dω a	-0.02	+0.05	+0.08	-0.26	0.00	0.00	-0.01	+0.03
Dψ δ, Dω δ	-0.3	-0.6	-0.3	-0.6	-0.3	-0.6	-0.3	-0.6

FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	109 Virginis. Mag. 3.8		8 Libræ. Mag. 5.3		α Libræ. Mag. 2.9		Groombridge 2164. Mag. 5.7	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 14 41	° ' " + 2 14	h m 14 45	° ' " - 15 38	h m 14 46	° ' " - 15 41	h m 14 49	° ' " + 59 37
	s	"	s	"	s	"	s	"
1. 0.8	56.88	52.1	58.68	44.2	10.13	25.3	16.31	57.5
10.8	57.20 32	50.0 21	59.02 34	45.7 15	10.46 33	26.9 16	16.77 46	54.9 26
20.8	57.53 33	48.1 19	59.36 34	47.4 17	10.81 35	28.5 16	17.27 50	52.9 20
30.8	57.86 33	46.3 18	59.71 35	49.0 16	11.15 34	30.2 17	17.78 51	51.5 14
4. 9.7	58.18 32	44.8 15	60.04 33	50.7 17	11.49 34	31.8 16	18.29 51	50.8 7
	31	13	32	15	32	16	50	1
19.7	58.49	43.5	60.36	52.2	11.81	33.4	18.79	50.7
7. 1.7	58.77 28	42.5 10	60.66 30	53.6 14	12.11 30	34.8 14	19.26 47	51.3 6
11.6	59.03 26	41.9 6	60.94 28	54.9 13	12.38 27	36.0 12	19.68 42	52.5 12
21.6	59.26 23	41.6 3	61.18 24	56.0 11	12.63 25	37.1 11	20.05 37	54.2 17
31.6	59.46 20	41.6 0	61.40 22	56.9 9	12.84 21	38.0 9	20.35 30	56.4 22
	17	2	18	7	19	8	24	26
7. 10.6	59.63	41.8	61.58	57.6	13.03	38.8	20.59	59.0
20.5	59.77 14	42.3 5	61.74 16	58.1 5	13.19 16	39.3 5	20.76 17	61.9 29
30.5	59.88 11	42.9 6	61.87 13	58.5 4	13.32 13	39.7 4	20.86 10	64.9 30
8. 10.5	59.97 9	43.7 8	61.97 10	58.8 3	13.41 9	40.0 3	20.88 2	68.0 31
20.5	60.02 5	44.6 9	62.04 7	58.9 1	13.48 7	40.1 1	20.84 4	71.0 30
	3	9	4	0	4	0	10	28
30.4	60.05	45.5	62.08	58.9	13.52	40.1	20.74	73.8
9. 9.4	60.05 0	46.5 10	62.09 1	58.9 0	13.54 2	40.1 0	20.58 16	76.4 26
19.4	60.02 3	47.4 9	62.07 2	58.7 2	13.52 2	39.9 2	20.36 22	78.7 23
29.3	59.97 5	48.3 9	62.03 4	58.5 2	13.48 4	39.7 2	20.10 26	80.6 19
10. 9.3	59.90 7	49.1 8	61.96 7	58.2 3	13.41 7	39.4 3	19.80 30	82.0 14
	10	7	9	4	9	4	34	9
19.3	59.80	49.8	61.87	57.8	13.32	39.0	19.46	82.9
29.3	59.69 11	50.4 6	61.76 11	57.4 4	13.21 11	38.6 4	19.10 36	83.4 5
11. 8.2	59.57 12	50.9 5	61.64 12	56.9 5	13.08 13	38.1 5	18.73 37	83.4 0
18.2	59.44 13	51.2 3	61.50 14	56.4 5	12.95 13	37.6 5	18.36 37	82.8 6
28.2	59.31 13	51.4 2	61.36 14	55.9 5	12.81 14	37.1 5	17.99 37	81.8 10
	13	0	13	5	13	5	36	16
12. 7.2	59.18	51.4	61.23	55.4	12.68	36.6	17.63	80.2
17.1	59.07 11	51.3 1	61.12 11	54.9 5	12.56 12	36.1 5	17.30 33	78.2 20
27.1	58.98 9	50.9 4	61.02 10	54.4 5	12.47 9	35.6 5	17.02 28	75.7 25
13. 7.1	58.91 7	50.3 6	60.96 6	54.1 3	12.41 6	35.3 3	16.78 24	72.9 28
17.0	58.89 2	49.5 8	60.94 2	53.9 2	12.38 3	35.1 2	16.60 18	69.8 31
	2	10	2	1	3	1	11	35
27.0	58.91	48.5	60.96	53.8	12.41	35.0	16.49	66.3
14. 6.0	58.97 6	47.2 13	61.03 7	54.0 2	12.48 7	35.2 2	16.46 3	62.7 36
16.0	59.08 11	45.7 15	61.15 12	54.4 4	12.60 12	35.6 4	16.51 5	58.9 38
25.9	59.25 17	44.0 17	61.33 18	55.0 6	12.77 17	36.2 6	16.65 14	55.1 38
15. 5.9	59.46 21	42.2 18	61.55 22	55.9 9	12.99 22	37.1 9	16.87 22	51.4 37
	24	20	26	11	27	11	30	35
15.9	59.70	40.2	61.81	57.0	13.26	38.2	17.17	47.9
25.9	59.98 28	38.1 21	62.11 30	58.3 13	13.56 30	39.5 13	17.54 37	44.7 32
35.8	60.29 31	36.0 21	62.44 33	59.8 15	13.88 32	41.0 15	17.97 43	41.8 29
16. δ, Tan δ	1.001	+0.039	1.038	-0.280	1.039	-0.281	1.978	+1.707
tan Place	57°.024	61''.72	58°.934	39''.87	10°.380	21''.05	16°.884	80''.62
17. Δα, Δδ	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.03	+0.08
Δδ, Δα	-0.3	-0.6	-0.3	-0.7	-0.3	-0.7	-0.3	-0.7

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Ursæ Minoris. Mag. 2.2		$\xi^2$ Libræ. Mag. 5.6		Piazzi 221. Mag. 5.8		$\beta$ Lupi. Mag. 2.8	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 14 50 s	° ' " +74 29 "	h m 14 52 s	° ' " -11 4 "	h m 14 52 s	° ' " +14 46 "	h m 14 52 s	° ' " -42 47 "
Jan. 0.8	54.92	45.8	8.93	8.0	12.26	67.8	56.70	29.9
10.8	55.67 75	43.4 24	9.26 33	9.7 17	12.58 32	65.5 23	57.12 42	30.5 6
20.8	56.49 82	41.6 18	9.59 33	11.4 17	12.90 32	63.4 21	57.55 43	31.4 9
30.8	57.36 87	40.4 12	9.93 34	13.1 17	13.23 33	61.6 18	57.98 43	32.7 13
Feb. 9.7	58.24 88	39.9 5	10.26 33	14.7 16	13.56 33	60.1 15	58.41 43	34.2 15
	87	2	32	14	31	10	41	16
19.7	59.11	40.1	10.58	16.1	13.87	59.1	58.82	35.8
Mar. 1.7	59.92 81	41.0 9	10.88 30	17.4 13	14.16 29	58.5 6	59.20 38	37.7 19
11.7	60.65 73	42.4 14	11.15 27	18.5 11	14.43 27	58.3 2	59.55 35	39.6 19
21.6	61.28 63	44.4 20	11.39 24	19.3 8	14.67 24	58.5 2	59.87 32	41.6 20
31.6	61.80 52	46.9 25	11.61 22	20.0 7	14.88 21	59.1 6	60.15 28	43.7 21
	39	28	19	4	17	9	25	20
Apr. 10.6	62.19	49.7	11.80	20.4	15.05	60.0	60.40	45.7
20.5	62.43 24	52.7 30	11.96 16	20.7 3	15.20 15	61.1 11	60.61 21	47.7 20
30.5	62.54 11	55.9 32	12.09 13	20.8 1	15.32 12	62.5 14	60.78 17	49.6 19
May 10.5	62.50 4	59.1 32	12.19 10	20.8 0	15.40 8	64.0 15	60.92 14	51.4 18
20.5	62.32 18	62.1 30	12.26 7	20.6 2	15.45 5	65.6 16	61.01 9	53.1 17
	30	29	5	2	3	16	5	15
30.4	62.02	65.0	12.31	20.4	15.48	67.2	61.06	54.6
June 9.4	61.60 42	67.5 25	12.32 1	20.1 3	15.47 1	68.7 15	61.07 1	56.0 14
19.4	61.08 52	69.7 22	12.31 1	19.7 4	15.44 3	70.1 14	61.04 3	57.1 11
29.4	60.47 61	71.5 18	12.27 4	19.3 4	15.38 6	71.4 13	60.97 7	58.0 9
July 9.3	59.79 68	72.8 13	12.21 6	18.8 5	15.30 8	72.5 11	60.87 10	58.7 7
	73	8	9	4	10	9	13	4
19.3	59.06	73.6	12.12	18.4	15.20	73.4	60.74	59.1
29.3	58.28 78	73.8 2	12.01 11	17.9 5	15.08 12	74.2 8	60.58 16	59.2 1
Aug. 8.2	57.49 79	73.6 2	11.89 12	17.4 5	14.94 14	74.6 4	60.40 18	58.9 3
18.2	56.69 80	72.8 8	11.76 13	17.0 4	14.80 14	74.8 2	60.21 19	58.4 5
28.2	55.91 78	71.5 13	11.62 14	16.5 5	14.65 15	74.8 0	60.01 20	57.6 8
	74	18	13	4	14	3	19	10
Sept. 7.2	55.17	69.7	11.49	16.1	14.51	74.5	59.82	56.6
17.1	54.48 69	67.4 23	11.37 12	15.8 3	14.38 13	73.9 6	59.65 17	55.3 13
27.1	53.86 62	64.7 27	11.28 9	15.5 3	14.27 11	73.0 9	59.52 13	53.9 14
Oct. 7.1	53.34 52	61.7 30	11.21 7	15.4 1	14.19 8	71.8 12	59.42 10	52.3 16
17.0	52.92 42	58.3 34	11.18 3	15.4 0	14.14 5	70.4 14	59.38 4	50.7 16
	29	36	2	2	0	17	1	15
27.0	52.63	54.7	11.20	15.6	14.14	68.7	59.39	49.2
Nov. 6.0	52.48 15	50.9 38	11.26 6	16.1 5	14.18 4	66.7 20	59.47 8	47.7 15
16.0	52.47 1	47.0 39	11.37 11	16.8 7	14.28 10	64.6 21	59.61 14	46.4 13
25.9	52.62 15	43.2 38	11.54 17	17.7 9	14.42 14	62.2 24	59.82 21	45.4 10
Dec. 5.9	52.92 30	39.5 37	11.75 21	18.8 11	14.62 20	59.7 25	60.10 28	44.7 7
	44	35	25	13	23	25	32	3
15.9	53.36	36.0	12.00	20.1	14.85	57.2	60.42	44.4
25.9	53.93 57	32.9 31	12.29 29	21.6 15	15.12 27	54.7 25	60.79 37	44.3 1
35.8	54.62 69	30.2 27	12.60 31	23.2 16	15.43 31	52.3 24	61.20 41	44.7 4
Sec $\delta$ , Tan $\delta$	3.741	+3.605	1.019	-0.196	1.034	+0.264	1.363	-0.926
Mean Place	56°.467	70''.25	9°.179	2''.22	12°.434	81''.14	57°.352	32''.73
$D'\psi\alpha$ , $D_\omega\alpha$	-0.06	+0.18	0.00	-0.01	0.00	+0.01	+0.02	-0.04
$D'\psi\delta$ , $D_\omega\delta$	-0.3	-0.7	-0.3	-0.7	-0.3	-0.7	-0.3	-0.7

FOR THE UPPER TRANSIT AT WASHINGTON.



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♎ Serpentis. Mag. 5.4		♊ Boötis. Mag. 3.5		♌ Libræ. Mag. 2.7		♈ Ursæ Minoris. Mag. 3.1	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 15 10 s	° ' + 5 14 "	h m 15 12 s	° ' + 33 37 "	h m 15 12 s	° ' - 9 4 "	h m 15 20 s	° ' + 72 7 "
m. 0.9	57.47	64.6	4.20	34.8	25.51	18.7	49.33	48.0
10.8	57.77 <sup>30</sup>	62.5 <sup>21</sup>	4.52 <sup>32</sup>	32.1 <sup>27</sup>	25.83 <sup>32</sup>	20.4 <sup>17</sup>	49.94 <sup>61</sup>	45.3 <sup>27</sup>
20.8	58.09 <sup>32</sup>	60.5 <sup>20</sup>	4.87 <sup>35</sup>	29.8 <sup>23</sup>	26.16 <sup>33</sup>	22.0 <sup>16</sup>	50.63 <sup>69</sup>	43.1 <sup>22</sup>
30.8	58.42 <sup>33</sup>	58.7 <sup>18</sup>	5.22 <sup>35</sup>	27.9 <sup>19</sup>	26.49 <sup>33</sup>	23.6 <sup>16</sup>	51.37 <sup>74</sup>	41.5 <sup>16</sup>
b. 9.7	58.74 <sup>32</sup> <sup>31</sup>	57.2 <sup>15</sup> <sup>12</sup>	5.58 <sup>36</sup> <sup>34</sup>	26.5 <sup>14</sup> <sup>8</sup>	26.82 <sup>33</sup> <sup>32</sup>	25.1 <sup>15</sup> <sup>14</sup>	52.14 <sup>77</sup> <sup>77</sup>	40.6 <sup>9</sup> <sup>2</sup>
19.7	59.05	56.0	5.92	25.7	27.14	26.5	52.91	40.4
ar. 1.7	59.35 <sup>30</sup>	55.1 <sup>9</sup>	6.25 <sup>33</sup>	25.5 <sup>2</sup>	27.44 <sup>30</sup>	27.7 <sup>12</sup>	53.65 <sup>74</sup>	40.8 <sup>4</sup>
11.7	59.62 <sup>27</sup>	54.6 <sup>5</sup>	6.55 <sup>30</sup>	25.8 <sup>3</sup>	27.72 <sup>28</sup>	28.6 <sup>9</sup>	54.34 <sup>69</sup>	41.9 <sup>11</sup>
21.6	59.87 <sup>25</sup>	54.4 <sup>2</sup>	6.83 <sup>28</sup>	26.7 <sup>9</sup>	27.98 <sup>26</sup>	29.3 <sup>7</sup>	54.96 <sup>62</sup>	43.6 <sup>17</sup>
31.6	60.09 <sup>22</sup> <sup>20</sup>	54.6 <sup>2</sup> <sup>4</sup>	7.07 <sup>24</sup> <sup>20</sup>	28.0 <sup>13</sup> <sup>17</sup>	28.22 <sup>24</sup> <sup>20</sup>	29.8 <sup>5</sup> <sup>3</sup>	55.49 <sup>53</sup> <sup>42</sup>	45.8 <sup>22</sup> <sup>26</sup>
r. 10.6	60.29	55.0	7.27	29.7	28.42	30.1	55.91	48.4
20.6	60.46 <sup>17</sup>	55.7 <sup>7</sup>	7.44 <sup>17</sup>	31.7 <sup>20</sup>	28.60 <sup>18</sup>	30.2 <sup>1</sup>	56.22 <sup>31</sup>	51.3 <sup>29</sup>
30.5	60.59 <sup>13</sup>	56.6 <sup>9</sup>	7.57 <sup>13</sup>	34.0 <sup>23</sup>	28.75 <sup>15</sup>	30.1 <sup>1</sup>	56.41 <sup>19</sup>	54.4 <sup>31</sup>
y 10.5	60.70 <sup>11</sup>	57.6 <sup>10</sup>	7.66 <sup>9</sup>	36.4 <sup>24</sup>	28.87 <sup>12</sup>	29.9 <sup>2</sup>	56.48 <sup>7</sup>	57.6 <sup>32</sup>
20.5	60.78 <sup>8</sup> <sup>5</sup>	58.8 <sup>12</sup> <sup>12</sup>	7.72 <sup>6</sup> <sup>1</sup>	38.8 <sup>24</sup> <sup>24</sup>	28.96 <sup>9</sup> <sup>6</sup>	29.6 <sup>3</sup> <sup>4</sup>	56.42 <sup>6</sup> <sup>17</sup>	60.8 <sup>32</sup> <sup>31</sup>
30.4	60.83	60.0	7.73	41.2	29.02	29.2	56.25	63.9
ne 9.4	60.85 <sup>2</sup>	61.1 <sup>11</sup>	7.71 <sup>2</sup>	43.5 <sup>23</sup>	29.05 <sup>3</sup>	28.7 <sup>5</sup>	55.97 <sup>28</sup>	66.7 <sup>28</sup>
19.4	60.85 <sup>0</sup>	62.3 <sup>12</sup>	7.66 <sup>5</sup>	45.6 <sup>21</sup>	29.05 <sup>0</sup>	28.2 <sup>5</sup>	55.60 <sup>37</sup>	69.2 <sup>25</sup>
29.4	60.81 <sup>4</sup>	63.4 <sup>11</sup>	7.57 <sup>9</sup>	47.5 <sup>19</sup>	29.02 <sup>3</sup>	27.7 <sup>5</sup>	55.13 <sup>47</sup>	71.4 <sup>22</sup>
ly 9.3	60.75 <sup>6</sup> <sup>9</sup>	64.3 <sup>9</sup> <sup>9</sup>	7.46 <sup>11</sup> <sup>14</sup>	49.1 <sup>16</sup> <sup>13</sup>	28.97 <sup>5</sup> <sup>8</sup>	27.2 <sup>5</sup> <sup>5</sup>	54.59 <sup>54</sup> <sup>61</sup>	73.1 <sup>17</sup> <sup>12</sup>
19.3	60.66	65.2	7.32	50.4	28.89	26.7	53.98	74.3
29.3	60.55 <sup>11</sup>	65.9 <sup>7</sup>	7.15 <sup>17</sup>	51.3 <sup>9</sup>	28.79 <sup>10</sup>	26.2 <sup>5</sup>	53.33 <sup>65</sup>	75.1 <sup>8</sup>
g. 8.3	60.43 <sup>12</sup>	66.4 <sup>5</sup>	6.96 <sup>19</sup>	51.8 <sup>5</sup>	28.67 <sup>12</sup>	25.8 <sup>4</sup>	52.64 <sup>69</sup>	75.3 <sup>2</sup>
18.2	60.29 <sup>14</sup>	66.8 <sup>4</sup>	6.77 <sup>19</sup>	51.9 <sup>1</sup>	28.53 <sup>14</sup>	25.3 <sup>5</sup>	51.94 <sup>70</sup>	75.0 <sup>3</sup>
28.2	60.15 <sup>14</sup> <sup>14</sup>	67.0 <sup>2</sup> <sup>0</sup>	6.57 <sup>20</sup> <sup>19</sup>	51.6 <sup>3</sup> <sup>7</sup>	28.39 <sup>14</sup> <sup>13</sup>	24.9 <sup>4</sup> <sup>3</sup>	51.23 <sup>71</sup> <sup>69</sup>	74.2 <sup>8</sup> <sup>14</sup>
st. 7.2	60.01	67.0	6.38	50.9	28.26	24.6	50.54	72.8
17.1	59.88 <sup>13</sup>	66.8 <sup>2</sup>	6.20 <sup>18</sup>	49.8 <sup>11</sup>	28.13 <sup>13</sup>	24.3 <sup>3</sup>	49.89 <sup>65</sup>	71.0 <sup>18</sup>
27.1	59.76 <sup>12</sup>	66.4 <sup>4</sup>	6.04 <sup>16</sup>	48.4 <sup>14</sup>	28.02 <sup>11</sup>	24.2 <sup>1</sup>	49.29 <sup>60</sup>	68.7 <sup>23</sup>
.. 7.1	59.67 <sup>9</sup>	65.7 <sup>7</sup>	5.91 <sup>13</sup>	46.5 <sup>19</sup>	27.94 <sup>8</sup>	24.2 <sup>0</sup>	48.76 <sup>53</sup>	66.0 <sup>27</sup>
17.1	59.62 <sup>5</sup> <sup>1</sup>	64.8 <sup>9</sup> <sup>11</sup>	5.82 <sup>9</sup> <sup>5</sup>	44.3 <sup>22</sup> <sup>25</sup>	27.89 <sup>5</sup> <sup>1</sup>	24.3 <sup>1</sup> <sup>3</sup>	48.32 <sup>44</sup> <sup>34</sup>	62.9 <sup>31</sup> <sup>34</sup>
27.0	59.61	63.7	5.77	41.8	27.88	24.6	47.98	59.5
v. 6.0	59.64 <sup>3</sup>	62.3 <sup>14</sup>	5.77 <sup>0</sup>	39.0 <sup>28</sup>	27.92 <sup>4</sup>	25.2 <sup>6</sup>	47.76 <sup>22</sup>	55.9 <sup>36</sup>
16.0	59.73 <sup>9</sup>	60.7 <sup>16</sup>	5.82 <sup>5</sup>	36.0 <sup>30</sup>	28.01 <sup>9</sup>	25.9 <sup>7</sup>	47.66 <sup>10</sup>	52.2 <sup>37</sup>
26.0	59.86 <sup>13</sup>	58.9 <sup>18</sup>	5.93 <sup>11</sup>	32.8 <sup>32</sup>	28.15 <sup>14</sup>	26.8 <sup>9</sup>	47.70 <sup>4</sup>	48.3 <sup>39</sup>
.. 5.9	60.04 <sup>18</sup> <sup>22</sup>	57.0 <sup>19</sup> <sup>21</sup>	6.10 <sup>17</sup> <sup>22</sup>	29.6 <sup>32</sup> <sup>32</sup>	28.34 <sup>19</sup> <sup>24</sup>	28.0 <sup>12</sup> <sup>13</sup>	47.88 <sup>18</sup> <sup>31</sup>	44.5 <sup>38</sup> <sup>36</sup>
15.9	60.26	54.9	6.32	26.4	28.58	29.3	48.19	40.9
25.9	60.52 <sup>26</sup>	52.7 <sup>22</sup>	6.59 <sup>27</sup>	23.4 <sup>30</sup>	28.85 <sup>27</sup>	30.8 <sup>15</sup>	48.62 <sup>43</sup>	37.6 <sup>33</sup>
35.8	60.81 <sup>29</sup>	50.6 <sup>21</sup>	6.89 <sup>30</sup>	20.5 <sup>29</sup>	29.15 <sup>30</sup>	32.4 <sup>16</sup>	49.17 <sup>55</sup>	34.6 <sup>30</sup>
Tan δ	1.004	+0.092	1.201	+0.665	1.013	-0.160	3.260	+3.102
Place	57°.747	75'''.36	4°.567	52'''.65	25°.843	11'''.92	51°.290	71'''.12
D. α	0.00	0.00	-0.01	+0.03	0.00	-0.01	-0.06	+0.13
D. δ	-0.3	-0.7	-0.3	-0.7	-0.3	-0.7	-0.3	-0.8



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Boötis <i>pr.</i> Mag. 4.5		$\tau^1$ Serpentis. Mag. 5.5		$\iota$ Draconis. Mag. 3.5		$\beta^2$ Libræ. Mag. 5.9	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 15 21	° ' " + 37 39	h m 15 21	° ' " + 15 43	h m 15 23	° ' " + 59 15	h m 15 23	° ' " - 16 25
Jan. 0.9	16.29	70.4	50.42	20.8	1.32	26.5	27.18	20.3
10.8	16.61 32	67.6 28	50.72 30	18.4 24	1.74 42	23.6 29	27.50 32	21.7 14
20.8	16.96 35	65.3 23	51.04 32	16.3 21	2.20 46	21.2 24	27.83 33	23.1 14
30.8	17.32 36	63.4 19	51.36 32	14.4 19	2.69 49	19.4 18	28.18 35	24.5 14
Feb. 9.8	17.68 36	62.0 14	51.69 33	12.9 15	3.19 50	18.3 11	28.52 34	25.9 14
		8	32	11	50	5	33	14
19.7	18.04	61.2	52.01	11.8	3.69	17.8	28.85	27.3
Mar. 1.7	18.38 34	61.0 2	52.31 30	11.1 7	4.17 48	18.0 2	29.16 31	28.5 12
11.7	18.70 32	61.4 4	52.59 28	10.9 2	4.62 45	18.8 8	29.46 30	29.6 11
21.6	18.99 29	62.3 9	52.85 26	11.1 2	5.02 40	20.3 15	29.73 27	30.5 9
31.6	19.25 26	63.7 14	53.08 23	11.7 6	5.37 35	22.3 20	29.98 25	31.3 8
	22	18	21	9	29	24	22	6
Apr. 10.6	19.47	65.5	53.29	12.6	5.66	24.7	30.20	31.9
20.6	19.65 18	67.7 22	53.46 17	13.9 13	5.89 23	27.4 27	30.40 20	32.4 5
30.5	19.79 14	70.1 24	53.60 14	15.3 14	6.04 15	30.4 30	30.56 16	32.7 3
May 10.5	19.89 10	72.7 26	53.72 12	16.9 16	6.13 9	33.5 31	30.70 14	32.9 2
20.5	19.94 5	75.3 26	53.80 8	18.6 17	6.15 2	36.7 32	30.81 11	33.0 1
	2	26	5	18	5	30	8	0
30.5	19.96	77.9	53.85	20.4	6.10	39.7	30.89	33.0
June 9.4	19.94 2	80.4 25	53.87 2	22.1 17	5.99 11	42.5 28	30.93 4	32.9 1
19.4	19.88 6	82.6 22	53.86 1	23.7 16	5.82 17	45.1 26	30.94 1	32.8 1
29.4	19.79 9	84.7 21	53.81 5	25.2 15	5.60 22	47.4 23	30.93 1	32.6 2
July 9.3	19.66 13	86.4 17	53.74 7	26.5 13	5.33 27	49.2 18	30.88 5	32.3 3
	15	14	9	11	32	14	8	3
19.3	19.51	87.8	53.65	27.6	5.01	50.6	30.80	32.0
29.3	19.33 18	88.8 10	53.53 12	28.4 8	4.67 34	51.5 9	30.70 10	31.7 3
Aug. 8.3	19.13 20	89.3 5	53.39 14	29.0 6	4.30 37	51.9 4	30.58 12	31.3 4
18.2	18.92 21	89.5 2	53.24 15	29.4 4	3.91 39	51.8 1	30.44 14	30.9 4
28.2	18.71 21	89.3 2	53.09 15	29.5 1	3.52 39	51.2 6	30.30 14	30.4 5
	22	7	16	2	38	11	14	4
Sept. 7.2	18.49	88.6	52.93	29.3	3.14	50.1	30.16	30.0
17.2	18.29 20	87.5 11	52.78 15	28.8 5	2.78 36	48.5 16	30.02 14	29.6 4
27.1	18.10 19	85.9 16	52.65 13	28.0 8	2.44 34	46.5 20	29.90 12	29.1 5
Oct. 7.1	17.95 15	84.0 19	52.54 11	26.9 11	2.15 29	44.0 25	29.80 10	28.8 3
17.1	17.84 11	81.7 23	52.47 7	25.6 13	1.92 23	41.1 29	29.75 5	28.6 2
	7	26	3	17	17	32	1	1
27.0	17.77	79.1	52.44	23.9	1.75	37.9	29.74	28.5
Nov. 6.0	17.75 2	76.2 29	52.45 1	22.0 19	1.65 10	34.4 35	29.77 3	28.5 0
16.0	17.78 3	73.1 31	52.52 7	19.9 21	1.63 2	30.8 36	29.85 8	28.7 2
26.0	17.88 10	69.8 33	52.63 11	17.5 24	1.70 7	27.0 38	29.99 14	29.2 5
Dec. 5.9	18.04 16	66.5 33	52.79 16	15.1 24	1.86 16	23.3 37	30.18 19	29.9 7
	21	33	21	26	23	37	23	9
15.9	18.25	63.2	53.00	12.5	2.09	19.6	30.41	30.8
25.9	18.51 26	60.0 32	53.25 25	10.0 25	2.40 31	16.2 34	30.69 28	31.9 11
35.9	18.81 30	57.0 30	53.53 28	7.5 25	2.78 38	13.1 31	30.99 30	33.1 12
Sec $\delta$ , Tan $\delta$	1.263	+0.772	1.039	+0.281	1.956	+1.681	1.043	-0.295
Mean Place	16°.763	88°.94	50°.763	34°.32	2°.326	48°.31	27°.596	15°.31
D' $\psi$ $\alpha$ , D $\omega$ $\alpha$	-0.02	+0.03	-0.01	+0.01	-0.03	+0.07	+0.01	-0.01
D' $\psi$ $\delta$ , D $\omega$ $\delta$	-0.3	-0.8	-0.3	-0.8	-0.3	-0.8	-0.3	-0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	<i>ρ</i> Octantis. Mag. 5.7		<i>β</i> Coronæ Borealis. Mag. 3.7		<i>ν</i> <sup>1</sup> Boötis. Mag. 5.2		<i>γ</i> Lupi ( <i>mean</i> ). Mag. 3.0	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 15 23 s	° ' —84 10 "	h m 15 24 s	° ' +29 23 "	h m 15 27 s	° ' +41 6 "	h m 15 29 s	° ' —40 52 "
n. 0.9	20.35	58.2	19.06	36.4	52.00	61.1	27.49	54.8
10.8	22.66 <sup>231</sup>	57.0 <sup>12</sup>	19.37 <sup>31</sup>	33.8 <sup>26</sup>	52.33 <sup>33</sup>	58.3 <sup>28</sup>	27.88 <sup>39</sup>	55.1 <sup>3</sup>
20.8	25.13 <sup>247</sup>	56.3 <sup>7</sup>	19.69 <sup>32</sup>	31.4 <sup>24</sup>	52.68 <sup>35</sup>	55.8 <sup>25</sup>	28.29 <sup>41</sup>	55.7 <sup>6</sup>
30.8	27.71 <sup>258</sup>	56.2 <sup>1</sup>	20.04 <sup>35</sup>	29.5 <sup>19</sup>	53.05 <sup>37</sup>	53.9 <sup>19</sup>	28.71 <sup>42</sup>	56.5 <sup>8</sup>
b. 9.8	30.32 <sup>261</sup>	56.6 <sup>4</sup>	20.38 <sup>34</sup>	28.0 <sup>15</sup>	53.43 <sup>38</sup>	52.5 <sup>14</sup>	29.13 <sup>42</sup>	57.6 <sup>11</sup>
	259 <sup>10</sup>		33 <sup>9</sup>		37 <sup>8</sup>		41 <sup>13</sup>	
19.7	32.91	57.6	20.71	27.1	53.80	51.7	29.54	58.9
r. 1.7	35.42 <sup>251</sup>	59.0 <sup>14</sup>	21.04 <sup>33</sup>	26.7 <sup>4</sup>	54.15 <sup>35</sup>	51.5 <sup>2</sup>	29.93 <sup>39</sup>	60.3 <sup>14</sup>
11.7	37.79 <sup>237</sup>	60.9 <sup>19</sup>	21.34 <sup>30</sup>	26.8 <sup>1</sup>	54.49 <sup>34</sup>	51.9 <sup>4</sup>	30.31 <sup>38</sup>	61.8 <sup>15</sup>
21.6	39.98 <sup>219</sup>	63.2 <sup>23</sup>	21.61 <sup>27</sup>	27.5 <sup>7</sup>	54.79 <sup>30</sup>	52.8 <sup>9</sup>	30.65 <sup>34</sup>	63.4 <sup>16</sup>
31.6	41.96 <sup>198</sup>	65.9 <sup>27</sup>	21.86 <sup>25</sup>	28.6 <sup>11</sup>	55.06 <sup>27</sup>	54.3 <sup>15</sup>	30.97 <sup>32</sup>	65.1 <sup>17</sup>
	173 <sup>29</sup>		21 <sup>15</sup>		24 <sup>20</sup>		28 <sup>17</sup>	
r. 10.6	43.69	68.8	22.07	30.1	55.30	56.3	31.25	66.8
20.6	45.14 <sup>145</sup>	71.9 <sup>31</sup>	22.25 <sup>18</sup>	32.0 <sup>19</sup>	55.49 <sup>19</sup>	58.5 <sup>22</sup>	31.50 <sup>25</sup>	68.4 <sup>16</sup>
30.5	46.29 <sup>115</sup>	75.2 <sup>33</sup>	22.39 <sup>14</sup>	34.1 <sup>21</sup>	55.64 <sup>15</sup>	61.1 <sup>26</sup>	31.72 <sup>22</sup>	70.0 <sup>16</sup>
y 10.5	47.11 <sup>82</sup>	78.5 <sup>33</sup>	22.49 <sup>10</sup>	36.3 <sup>22</sup>	55.74 <sup>10</sup>	63.8 <sup>27</sup>	31.90 <sup>18</sup>	71.6 <sup>16</sup>
20.5	47.60 <sup>49</sup>	81.8 <sup>33</sup>	22.56 <sup>7</sup>	38.6 <sup>23</sup>	55.80 <sup>6</sup>	66.5 <sup>27</sup>	32.03 <sup>13</sup>	73.2 <sup>16</sup>
	14 <sup>33</sup>		4 <sup>24</sup>		2 <sup>27</sup>		10 <sup>14</sup>	
30.5	47.74	85.1	22.60	41.0	55.82	69.2	32.13	74.6
ie 9.4	47.54 <sup>20</sup>	88.2 <sup>31</sup>	22.60 <sup>0</sup>	43.2 <sup>22</sup>	55.80 <sup>2</sup>	71.8 <sup>26</sup>	32.19 <sup>6</sup>	75.8 <sup>12</sup>
19.4	47.01 <sup>53</sup>	91.2 <sup>30</sup>	22.57 <sup>3</sup>	45.3 <sup>21</sup>	55.74 <sup>6</sup>	74.2 <sup>24</sup>	32.21 <sup>2</sup>	77.0 <sup>12</sup>
29.4	46.16 <sup>85</sup>	93.8 <sup>26</sup>	22.50 <sup>7</sup>	47.2 <sup>19</sup>	55.64 <sup>10</sup>	76.4 <sup>22</sup>	32.18 <sup>3</sup>	77.9 <sup>9</sup>
y 9.3	45.02 <sup>114</sup>	96.0 <sup>22</sup>	22.40 <sup>10</sup>	48.8 <sup>16</sup>	55.50 <sup>14</sup>	78.2 <sup>18</sup>	32.11 <sup>7</sup>	78.7 <sup>8</sup>
	140 <sup>18</sup>		12 <sup>13</sup>		17 <sup>14</sup>		10 <sup>5</sup>	
19.3	43.62	97.8	22.28	50.1	55.33	79.6	32.01	79.2
29.3	42.01 <sup>161</sup>	99.2 <sup>14</sup>	22.13 <sup>15</sup>	51.1 <sup>10</sup>	55.14 <sup>19</sup>	80.7 <sup>11</sup>	31.87 <sup>14</sup>	79.5 <sup>3</sup>
g. 8.3	40.25 <sup>176</sup>	100.0 <sup>8</sup>	21.96 <sup>17</sup>	51.7 <sup>6</sup>	54.93 <sup>21</sup>	81.3 <sup>6</sup>	31.70 <sup>17</sup>	79.6 <sup>1</sup>
18.2	38.40 <sup>185</sup>	100.3 <sup>3</sup>	21.78 <sup>18</sup>	52.0 <sup>3</sup>	54.70 <sup>23</sup>	81.5 <sup>2</sup>	31.52 <sup>18</sup>	79.3 <sup>3</sup>
28.2	36.52 <sup>188</sup>	100.0 <sup>3</sup>	21.59 <sup>19</sup>	51.9 <sup>1</sup>	54.46 <sup>24</sup>	81.2 <sup>3</sup>	31.32 <sup>20</sup>	78.8 <sup>5</sup>
	183 <sup>9</sup>		19 <sup>5</sup>		23 <sup>23</sup>		19 <sup>7</sup>	
pt. 7.2	34.69	99.1	21.40	51.4	54.23	80.6	31.13	78.1
17.2	32.98 <sup>171</sup>	97.7 <sup>14</sup>	21.23 <sup>17</sup>	50.6 <sup>8</sup>	54.01 <sup>22</sup>	79.4 <sup>12</sup>	30.94 <sup>19</sup>	77.1 <sup>10</sup>
27.1	31.47 <sup>151</sup>	95.8 <sup>19</sup>	21.07 <sup>16</sup>	49.3 <sup>13</sup>	53.80 <sup>21</sup>	77.8 <sup>16</sup>	30.78 <sup>16</sup>	76.0 <sup>11</sup>
t. 7.1	30.23 <sup>124</sup>	93.4 <sup>24</sup>	20.93 <sup>14</sup>	47.7 <sup>16</sup>	53.63 <sup>17</sup>	75.9 <sup>19</sup>	30.65 <sup>13</sup>	74.7 <sup>13</sup>
17.1	29.32 <sup>91</sup>	90.8 <sup>26</sup>	20.84 <sup>9</sup>	45.8 <sup>19</sup>	53.50 <sup>13</sup>	73.5 <sup>24</sup>	30.57 <sup>8</sup>	73.3 <sup>14</sup>
	53 <sup>30</sup>		6 <sup>23</sup>		9 <sup>9</sup>		3 <sup>14</sup>	
27.0	28.79	87.8	20.78	43.5	53.41	70.8	30.54	71.9
v. 6.0	28.67 <sup>12</sup>	84.8 <sup>30</sup>	20.77 <sup>1</sup>	40.9 <sup>26</sup>	53.37 <sup>4</sup>	67.8 <sup>30</sup>	30.57 <sup>3</sup>	70.5 <sup>14</sup>
16.0	28.98 <sup>31</sup>	81.6 <sup>32</sup>	20.82 <sup>5</sup>	38.1 <sup>28</sup>	53.40 <sup>3</sup>	64.6 <sup>32</sup>	30.67 <sup>10</sup>	69.3 <sup>12</sup>
26.0	29.73 <sup>75</sup>	78.6 <sup>30</sup>	20.92 <sup>10</sup>	35.2 <sup>29</sup>	53.48 <sup>8</sup>	61.2 <sup>34</sup>	30.83 <sup>16</sup>	68.2 <sup>11</sup>
c. 5.9	30.90 <sup>117</sup>	75.9 <sup>27</sup>	21.08 <sup>16</sup>	32.2 <sup>30</sup>	53.63 <sup>15</sup>	57.8 <sup>34</sup>	31.06 <sup>23</sup>	67.4 <sup>8</sup>
	155 <sup>25</sup>		20 <sup>31</sup>		20 <sup>34</sup>		28 <sup>6</sup>	
15.9	32.45	73.4	21.28	29.1	53.83	54.4	31.34	66.8
25.9	34.33 <sup>188</sup>	71.4 <sup>20</sup>	21.53 <sup>25</sup>	26.1 <sup>30</sup>	54.09 <sup>26</sup>	51.1 <sup>33</sup>	31.67 <sup>33</sup>	66.6 <sup>2</sup>
35.9	36.49 <sup>216</sup>	69.8 <sup>16</sup>	21.81 <sup>28</sup>	23.3 <sup>28</sup>	54.39 <sup>30</sup>	48.1 <sup>30</sup>	32.04 <sup>37</sup>	66.6 <sup>0</sup>
, Tan δ	9.876	−9.825	1.148	+8.563	1.327	+0.873	1.323	−0.866
Place	29°.89*	65''.28	19°.475	53''.12	52°.571	80''.07	28°.255	55''.46
, D <sub>∞</sub> α	+0.20	−0.41	−0.01	+0.02	−0.02	+0.04	+0.02	−0.04
D <sub>∞</sub> δ	−0.3	−0.8	−0.3	−0.8	−0.2	−0.8	−0.2	−0.8



FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	$\beta$ Serpentis. Mag. 3.7		$\kappa$ Serpentis. Mag. 4.3		$\mu$ Serpentis. Mag. 3.6		12 H. Draconis. Mag. 5.1	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 15 42 s	° ' " + 15 40 "	h m 15 44 s	° ' " + 18 23 "	h m 15 45 s	° ' " - 3 10 "	h m 15 45 s	° ' " + 62 51 "
n. 0.9	15.44 28	60.1 24	54.30 28	58.0 25	10.51 29	23.8 18	20.56 42	21.9 30
10.9	15.72 31	57.7 22	54.58 31	55.5 23	10.80 31	25.6 17	20.98 47	18.9 26
20.8	16.03 32	55.5 19	54.89 32	53.2 19	11.11 32	27.3 16	21.45 51	16.3 20
30.8	16.35 32	53.6 15	55.21 33	51.3 16	11.43 32	28.9 14	21.96 54	14.3 13
b. 9.8	16.67 32	52.1 12	55.54 32	49.7 11	11.75 32	30.3 12	22.50 55	13.0 7
19.7	16.99 31	50.9 7	55.86 31	48.6 7	12.07 31	31.5 10	23.05 54	12.3 0
ar. 1.7	17.30 29	50.2 3	56.17 29	47.9 2	12.38 29	32.5 7	23.59 50	12.3 6
11.7	17.59 27	49.9 2	56.46 27	47.7 2	12.67 27	33.2 5	24.09 47	12.9 13
21.7	17.86 24	50.1 6	56.73 25	47.9 6	12.94 25	33.7 1	24.56 42	14.2 19
31.6	18.10 22	50.7 9	56.98 22	48.5 11	13.19 23	33.8 1	24.98 35	16.1 23
or. 10.6	18.32 20	51.6 12	57.20 20	49.6 13	13.42 20	33.7 3	25.33 28	18.4 27
20.6	18.52 16	52.8 15	57.40 16	50.9 16	13.62 17	33.4 5	25.61 21	21.1 30
30.6	18.68 13	54.3 17	57.56 13	52.5 18	13.79 15	32.9 6	25.82 12	24.1 32
ay 10.5	18.81 10	56.0 17	57.69 10	54.3 19	13.94 12	32.3 8	25.94 5	27.3 32
20.5	18.91 7	57.7 18	57.79 7	56.2 20	14.06 8	31.5 8	25.99 3	30.5 31
30.5	18.98 4	59.5 18	57.86 4	58.2 19	14.14 6	30.7 9	25.96 10	33.6 30
ne 9.4	19.02 0	61.3 17	57.90 0	60.1 18	14.20 3	29.8 8	25.86 17	36.6 28
19.4	19.02 2	63.0 16	57.90 3	61.9 17	14.23 1	29.0 8	25.69 24	39.4 25
29.4	19.00 6	64.6 14	57.87 6	63.6 15	14.22 4	28.2 8	25.45 30	41.9 21
ly 9.4	18.94 9	66.0 12	57.81 9	65.1 13	14.18 6	27.4 7	25.15 35	44.0 16
19.3	18.85 11	67.2 10	57.72 11	66.4 10	14.12 9	26.7 7	24.80 39	45.6 12
29.3	18.74 13	68.2 7	57.61 14	67.4 8	14.03 12	26.0 5	24.41 42	46.8 7
ig. 8.3	18.61 15	68.9 5	57.47 15	68.2 4	13.91 13	25.5 5	23.99 45	47.5 2
18.2	18.46 16	69.4 2	57.32 17	68.6 2	13.78 15	25.0 3	23.54 46	47.7 3
28.2	18.30 17	69.6 1	57.15 17	68.8 1	13.63 15	24.7 2	23.08 46	47.4 9
pt. 7.2	18.13 16	69.5 4	56.98 16	68.7 4	13.48 14	24.5 1	22.62 44	46.5 14
17.2	17.97 14	69.1 7	56.82 15	68.3 8	13.34 13	24.4 1	22.18 41	45.1 18
27.1	17.83 12	68.4 10	56.67 13	67.5 11	13.21 11	24.5 2	21.77 37	43.3 23
ct. 7.1	17.71 9	67.4 13	56.54 10	66.4 14	13.10 8	24.7 4	21.40 32	41.0 27
17.1	17.62 5	66.1 15	56.44 6	65.0 17	13.02 4	25.1 6	21.08 25	38.3 31
27.1	17.57 1	64.6 18	56.38 1	63.3 19	12.98 1	25.7 8	20.83 17	35.2 34
ov. 6.0	17.56 4	62.8 21	56.37 4	61.4 22	12.99 5	26.5 10	20.66 8	31.8 36
16.0	17.60 9	60.7 23	56.41 9	59.2 24	13.04 11	27.5 12	20.58 1	28.2 37
26.0	17.69 15	58.4 24	56.50 13	56.8 26	13.15 15	28.7 14	20.59 11	24.5 38
oc. 5.9	17.84 19	56.0 25	56.63 19	54.2 26	13.30 20	30.1 15	20.70 20	20.7 37
15.9	18.03 23	53.5 26	56.82 23	51.6 26	13.50 24	31.6 17	20.90 29	17.0 36
25.9	18.26 27	50.9 24	57.05 26	49.0 26	13.74 28	33.3 17	21.19 37	13.4 32
35.9	18.53	48.5	57.31	46.4	14.02	35.0	21.56	10.2
$\delta$ , Tan $\delta$ n Place	1.039 15°.876	+0.281 73''.45	1.054 54°.765	+0.333 71''.83	1.002 10°.949	-0.055 15''.08	2.192 22°.054	+1.951 43''.02
$\alpha$ , D $\alpha$ $\alpha$	-0.01	+0.01	-0.01	+0.01	0.00	0.00	-0.04	+0.07
$\delta$ , D $\alpha$ $\delta$	-0.2	-0.8	-0.2	-0.8	-0.2	-0.8	-0.2	-0.8



FOR THE UPPER TRANSIT AT



FOR THE UPPER TRANSIT AT WASHINGTON.



FOR THE UPPER TRANSIT AT

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	τ Herculis. Mag. 3.9		γ Herculis. Mag. 3.8		η Ursæ Minoris. Mag. 5.0		γ Apodis. Mag. 3.9	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 16 17	° ' +46 30	h m 16 18	° ' +19 20	h m 16 19	° ' +75 56	h m 16 20	° ' -78 42
	s	"	s	"	s	"	s	"
Jan. 0.9	10.08	37.1	9.56	53.6	54.19	46.3	17.30	27.6
10.9	10.37 <sup>29</sup>	34.0 <sup>31</sup>	9.82 <sup>26</sup>	51.1 <sup>25</sup>	54.74 <sup>55</sup>	43.2 <sup>31</sup>	18.39 <sup>109</sup>	25.8 <sup>18</sup>
20.8	10.70 <sup>33</sup>	31.2 <sup>28</sup>	10.10 <sup>28</sup>	48.8 <sup>23</sup>	55.43 <sup>69</sup>	40.4 <sup>28</sup>	19.62 <sup>123</sup>	24.4 <sup>14</sup>
30.8	11.06 <sup>36</sup>	28.8 <sup>24</sup>	10.41 <sup>31</sup>	46.8 <sup>20</sup>	56.22 <sup>79</sup>	38.2 <sup>22</sup>	20.94 <sup>132</sup>	23.5 <sup>9</sup>
Feb. 9.8	11.44 <sup>38</sup>	27.1 <sup>17</sup>	10.72 <sup>31</sup>	45.1 <sup>17</sup>	57.09 <sup>87</sup>	36.6 <sup>16</sup>	22.32 <sup>138</sup>	23.1 <sup>4</sup>
	39	12	32	12	92	9	140	1
19.8	11.83	25.9	11.04	43.9	58.01	35.7	23.72	23.2
Mar. 1.7	12.22 <sup>39</sup>	25.3 <sup>6</sup>	11.36 <sup>32</sup>	43.1 <sup>8</sup>	58.95 <sup>94</sup>	35.4 <sup>3</sup>	25.13 <sup>141</sup>	23.8 <sup>6</sup>
11.7	12.60 <sup>38</sup>	25.4 <sup>1</sup>	11.66 <sup>30</sup>	42.8 <sup>3</sup>	59.87 <sup>92</sup>	35.8 <sup>4</sup>	26.51 <sup>138</sup>	24.8 <sup>10</sup>
21.7	12.95 <sup>35</sup>	26.1 <sup>7</sup>	11.95 <sup>29</sup>	42.9 <sup>1</sup>	60.73 <sup>86</sup>	36.8 <sup>10</sup>	27.83 <sup>132</sup>	26.2 <sup>14</sup>
31.7	13.28 <sup>33</sup>	27.4 <sup>13</sup>	12.22 <sup>27</sup>	43.6 <sup>7</sup>	61.52 <sup>79</sup>	38.5 <sup>17</sup>	29.07 <sup>124</sup>	28.0 <sup>18</sup>
	30	18	25	10	68	22	115	22
Apr. 10.6	13.58	29.2	12.47	44.6	62.20	40.7	30.22	30.2
20.6	13.83 <sup>25</sup>	31.5 <sup>23</sup>	12.69 <sup>22</sup>	46.0 <sup>14</sup>	62.76 <sup>56</sup>	43.3 <sup>26</sup>	31.24 <sup>102</sup>	32.6 <sup>24</sup>
30.6	14.05 <sup>22</sup>	34.1 <sup>26</sup>	12.88 <sup>19</sup>	47.6 <sup>16</sup>	63.19 <sup>43</sup>	46.2 <sup>29</sup>	32.13 <sup>89</sup>	35.3 <sup>27</sup>
May 10.5	14.21 <sup>16</sup>	36.9 <sup>28</sup>	13.05 <sup>17</sup>	49.5 <sup>19</sup>	63.46 <sup>27</sup>	49.4 <sup>32</sup>	32.87 <sup>74</sup>	38.1 <sup>28</sup>
20.5	14.33 <sup>12</sup>	39.9 <sup>30</sup>	13.18 <sup>13</sup>	51.5 <sup>20</sup>	63.58 <sup>12</sup>	52.6 <sup>32</sup>	33.45 <sup>58</sup>	41.0 <sup>29</sup>
	7	30	10	21	4	33	40	30
30.5	14.40	42.9	13.28	53.6	63.54	55.9	33.85	44.0
June 9.5	14.42 <sup>2</sup>	45.9 <sup>30</sup>	13.35 <sup>7</sup>	55.7 <sup>21</sup>	63.35 <sup>19</sup>	59.1 <sup>32</sup>	34.08 <sup>23</sup>	47.0 <sup>30</sup>
19.4	14.39 <sup>3</sup>	48.7 <sup>28</sup>	13.38 <sup>3</sup>	57.7 <sup>20</sup>	63.02 <sup>33</sup>	62.1 <sup>30</sup>	34.12 <sup>4</sup>	49.9 <sup>29</sup>
29.4	14.31 <sup>8</sup>	51.4 <sup>27</sup>	13.37 <sup>1</sup>	59.6 <sup>19</sup>	62.55 <sup>47</sup>	64.8 <sup>27</sup>	33.97 <sup>15</sup>	52.7 <sup>28</sup>
July 9.4	14.19 <sup>12</sup>	53.7 <sup>23</sup>	13.33 <sup>4</sup>	61.3 <sup>17</sup>	61.96 <sup>59</sup>	67.2 <sup>24</sup>	33.65 <sup>32</sup>	55.2 <sup>25</sup>
	16	20	7	15	70	20	49	21
19.4	14.03	55.7	13.26	62.8	61.26	69.2	33.16	57.3
29.3	13.82 <sup>21</sup>	57.3 <sup>16</sup>	13.15 <sup>11</sup>	64.1 <sup>13</sup>	60.47 <sup>79</sup>	70.8 <sup>16</sup>	32.52 <sup>64</sup>	59.1 <sup>18</sup>
Aug. 8.3	13.59 <sup>23</sup>	58.5 <sup>12</sup>	13.02 <sup>13</sup>	65.1 <sup>10</sup>	59.60 <sup>87</sup>	71.8 <sup>10</sup>	31.76 <sup>76</sup>	60.5 <sup>14</sup>
18.3	13.33 <sup>26</sup>	59.2 <sup>7</sup>	12.87 <sup>15</sup>	65.8 <sup>7</sup>	58.68 <sup>92</sup>	72.4 <sup>6</sup>	30.90 <sup>86</sup>	61.4 <sup>9</sup>
28.2	13.05 <sup>28</sup>	59.5 <sup>3</sup>	12.70 <sup>17</sup>	66.2 <sup>4</sup>	57.72 <sup>96</sup>	72.4 <sup>0</sup>	29.97 <sup>93</sup>	61.7 <sup>3</sup>
	28	2	18	1	97	4	96	2
Sept. 7.2	12.77	59.3	12.52	66.3	56.75	72.0	29.01	61.5
17.2	12.48 <sup>29</sup>	58.6 <sup>7</sup>	12.34 <sup>18</sup>	66.0 <sup>3</sup>	55.80 <sup>95</sup>	71.0 <sup>10</sup>	28.07 <sup>94</sup>	60.8 <sup>7</sup>
27.2	12.21 <sup>27</sup>	57.4 <sup>12</sup>	12.17 <sup>17</sup>	65.4 <sup>6</sup>	54.89 <sup>91</sup>	69.5 <sup>15</sup>	27.18 <sup>89</sup>	59.6 <sup>12</sup>
Oct. 7.1	11.97 <sup>24</sup>	55.8 <sup>16</sup>	12.02 <sup>15</sup>	64.5 <sup>9</sup>	54.03 <sup>86</sup>	67.5 <sup>20</sup>	26.39 <sup>79</sup>	57.9 <sup>17</sup>
17.1	11.75 <sup>22</sup>	53.8 <sup>20</sup>	11.90 <sup>12</sup>	63.3 <sup>12</sup>	53.25 <sup>78</sup>	65.1 <sup>24</sup>	25.73 <sup>66</sup>	55.7 <sup>22</sup>
	17	25	9	16	67	28	48	25
27.1	11.58	51.3	11.81	61.7	52.58	62.3	25.25	53.2
Nov. 6.1	11.47 <sup>11</sup>	48.5 <sup>28</sup>	11.76 <sup>5</sup>	59.9 <sup>18</sup>	52.04 <sup>54</sup>	59.2 <sup>31</sup>	24.96 <sup>29</sup>	50.4 <sup>28</sup>
16.0	11.41 <sup>6</sup>	45.4 <sup>31</sup>	11.76 <sup>0</sup>	57.8 <sup>21</sup>	51.65 <sup>39</sup>	55.8 <sup>34</sup>	24.89 <sup>7</sup>	47.5 <sup>29</sup>
26.0	11.42 <sup>1</sup>	42.0 <sup>34</sup>	11.82 <sup>6</sup>	55.4 <sup>24</sup>	51.42 <sup>23</sup>	52.2 <sup>36</sup>	25.05 <sup>16</sup>	44.5 <sup>30</sup>
Dec. 6.0	11.49 <sup>7</sup>	38.5 <sup>35</sup>	11.92 <sup>10</sup>	52.9 <sup>25</sup>	51.36 <sup>6</sup>	48.5 <sup>37</sup>	25.44 <sup>39</sup>	41.6 <sup>29</sup>
	14	35	15	26	12	37	61	27
15.9	11.63	35.0	12.07	50.3	51.48	44.8	26.05	38.9
25.9	11.83 <sup>20</sup>	31.5 <sup>35</sup>	12.27 <sup>20</sup>	47.7 <sup>26</sup>	51.77 <sup>29</sup>	41.2 <sup>36</sup>	26.87 <sup>82</sup>	36.4 <sup>25</sup>
35.9	12.08 <sup>25</sup>	28.2 <sup>33</sup>	12.51 <sup>24</sup>	45.1 <sup>26</sup>	52.22 <sup>45</sup>	37.9 <sup>33</sup>	27.86 <sup>99</sup>	34.4 <sup>20</sup>
Sec δ, Tan δ	1.453	+1.054	1.060	+0.351	4.119	+3.995	5.109	-5.010
Mean Place	11 <sup>h</sup> .149	54 <sup>m</sup> .78	10 <sup>h</sup> .185	67 <sup>m</sup> .03	58 <sup>h</sup> .320	65 <sup>m</sup> .99	22 <sup>h</sup> .413	30 <sup>m</sup> .41
D <sub>1</sub> α, D <sub>2</sub> α	-0.03	+0.03	-0.01	+0.01	-0.10	+0.11	+0.12	-0.14
D <sub>1</sub> δ, D <sub>2</sub> δ	-0.2	-0.9	-0.2	-0.9	-0.2	-0.9	-0.2	-0.9

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\omega$ Herculis. Mag. 4.5		$\eta$ Draconis. Mag. 2.9		$\alpha$ Scorpii. (Antares.) Mag. 1.2		$\beta$ Herculis. Mag. 2.8	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	D t
	h m 16 21	° ' " + 14 13	h m 16 22	° ' " + 61 41	h m 16 24	° ' " - 26 14	h m 16 26	+
	s	"	s	"	s	"	s	
Jan. 0.9	28.71	29.2	48.40	64.0	10.88	44.0	33.19	
10.9	28.97 <sup>26</sup>	26.9 <sup>23</sup>	48.74 <sup>34</sup>	60.8 <sup>32</sup>	11.18 <sup>30</sup>	44.4 <sup>4</sup>	33.44 <sup>25</sup>	
20.9	29.25 <sup>28</sup>	24.7 <sup>22</sup>	49.15 <sup>41</sup>	57.9 <sup>29</sup>	11.51 <sup>33</sup>	45.0 <sup>6</sup>	33.72 <sup>28</sup>	
30.8	29.55 <sup>30</sup>	22.8 <sup>19</sup>	49.61 <sup>46</sup>	55.5 <sup>24</sup>	11.85 <sup>34</sup>	45.8 <sup>8</sup>	34.03 <sup>31</sup>	
Feb. 9.8	29.86 <sup>31</sup>	21.2 <sup>16</sup>	50.11 <sup>50</sup>	53.8 <sup>17</sup>	12.20 <sup>35</sup>	46.6 <sup>8</sup>	34.34 <sup>31</sup>	
	32	13	52	12	36	9	32	
19.8	30.18	19.9	50.63	52.6	12.56	47.5	34.66	
Mar. 1.7	30.49 <sup>31</sup>	19.1 <sup>8</sup>	51.15 <sup>52</sup>	52.1 <sup>5</sup>	12.91 <sup>35</sup>	48.3 <sup>8</sup>	34.98 <sup>32</sup>	
11.7	30.79 <sup>30</sup>	18.7 <sup>4</sup>	51.66 <sup>51</sup>	52.4 <sup>3</sup>	13.25 <sup>34</sup>	49.2 <sup>9</sup>	35.29 <sup>31</sup>	
21.7	31.08 <sup>29</sup>	18.8 <sup>1</sup>	52.14 <sup>48</sup>	53.2 <sup>8</sup>	13.58 <sup>33</sup>	50.0 <sup>8</sup>	35.58 <sup>29</sup>	
31.7	31.34 <sup>26</sup>	19.2 <sup>4</sup>	52.58 <sup>44</sup>	54.7 <sup>15</sup>	13.88 <sup>30</sup>	50.7 <sup>7</sup>	35.86 <sup>28</sup>	
	25	8	40	21	29	6	25	
Apr. 10.6	31.59	20.0	52.98	56.8	14.17	51.3	36.11	
20.6	31.82 <sup>23</sup>	21.2 <sup>12</sup>	53.31 <sup>33</sup>	59.3 <sup>25</sup>	14.44 <sup>27</sup>	52.0 <sup>7</sup>	36.34 <sup>23</sup>	
30.6	32.02 <sup>20</sup>	22.6 <sup>14</sup>	53.58 <sup>27</sup>	62.1 <sup>28</sup>	14.68 <sup>24</sup>	52.5 <sup>5</sup>	36.54 <sup>20</sup>	
May 10.5	32.18 <sup>16</sup>	24.3 <sup>17</sup>	53.78 <sup>20</sup>	65.2 <sup>31</sup>	14.89 <sup>21</sup>	53.0 <sup>5</sup>	36.72 <sup>18</sup>	
20.5	32.32 <sup>14</sup>	26.1 <sup>18</sup>	53.90 <sup>12</sup>	68.4 <sup>32</sup>	15.07 <sup>18</sup>	53.5 <sup>5</sup>	36.86 <sup>14</sup>	
	11	18	5	33	14	4	10	
30.5	32.43	27.9	53.95	71.7	15.21	53.9	36.96	
June 9.5	32.50 <sup>7</sup>	29.8 <sup>19</sup>	53.92 <sup>3</sup>	74.9 <sup>32</sup>	15.32 <sup>11</sup>	54.3 <sup>4</sup>	37.03 <sup>7</sup>	
19.4	32.54 <sup>4</sup>	31.6 <sup>18</sup>	53.82 <sup>10</sup>	78.0 <sup>31</sup>	15.40 <sup>8</sup>	54.6 <sup>3</sup>	37.07 <sup>4</sup>	
29.4	32.55 <sup>1</sup>	33.3 <sup>17</sup>	53.65 <sup>17</sup>	80.8 <sup>28</sup>	15.43 <sup>3</sup>	54.9 <sup>3</sup>	37.06 <sup>1</sup>	
July 9.4	32.52 <sup>3</sup>	34.9 <sup>16</sup>	53.42 <sup>23</sup>	83.3 <sup>25</sup>	15.42 <sup>1</sup>	55.1 <sup>2</sup>	37.03 <sup>3</sup>	
	6	13	30	21	4	2	8	
19.4	32.46	36.2	53.12	85.4	15.38	55.3	36.95	
29.3	32.36 <sup>10</sup>	37.4 <sup>12</sup>	52.77 <sup>35</sup>	87.1 <sup>17</sup>	15.30 <sup>8</sup>	55.4 <sup>1</sup>	36.85 <sup>10</sup>	
Aug. 8.3	32.24 <sup>12</sup>	38.4 <sup>10</sup>	52.38 <sup>39</sup>	88.3 <sup>12</sup>	15.19 <sup>11</sup>	55.4 <sup>0</sup>	36.72 <sup>13</sup>	
18.3	32.10 <sup>14</sup>	39.0 <sup>6</sup>	51.96 <sup>42</sup>	89.1 <sup>8</sup>	15.05 <sup>14</sup>	55.3 <sup>1</sup>	36.56 <sup>16</sup>	
28.2	31.94 <sup>16</sup>	39.4 <sup>4</sup>	51.52 <sup>44</sup>	89.3 <sup>2</sup>	14.89 <sup>16</sup>	55.1 <sup>2</sup>	36.38 <sup>18</sup>	
	17	2	46	3	17	3	18	
Sept. 7.2	31.77	39.6	51.06	89.0	14.72	54.8	36.20	
17.2	31.60 <sup>17</sup>	39.5 <sup>1</sup>	50.60 <sup>46</sup>	88.2 <sup>8</sup>	14.55 <sup>17</sup>	54.3 <sup>5</sup>	36.01 <sup>19</sup>	
27.2	31.43 <sup>17</sup>	39.0 <sup>5</sup>	50.17 <sup>43</sup>	86.9 <sup>13</sup>	14.39 <sup>16</sup>	53.8 <sup>5</sup>	35.84 <sup>17</sup>	
Oct. 7.1	31.29 <sup>14</sup>	38.2 <sup>8</sup>	49.76 <sup>41</sup>	85.1 <sup>18</sup>	14.25 <sup>14</sup>	53.3 <sup>5</sup>	35.68 <sup>16</sup>	
17.1	31.17 <sup>12</sup>	37.2 <sup>10</sup>	49.40 <sup>36</sup>	82.8 <sup>23</sup>	14.14 <sup>11</sup>	52.7 <sup>6</sup>	35.54 <sup>14</sup>	
	8	13	30	27	7	6	10	
27.1	31.09	35.9	49.10	80.1	14.07	52.1	35.44	
Nov. 6.1	31.05 <sup>4</sup>	34.3 <sup>16</sup>	48.87 <sup>23</sup>	77.1 <sup>30</sup>	14.05 <sup>2</sup>	51.6 <sup>5</sup>	35.38 <sup>6</sup>	
16.0	31.05 <sup>0</sup>	32.5 <sup>18</sup>	48.72 <sup>15</sup>	73.7 <sup>34</sup>	14.08 <sup>3</sup>	51.1 <sup>5</sup>	35.37 <sup>1</sup>	
26.0	31.10 <sup>5</sup>	30.4 <sup>21</sup>	48.65 <sup>7</sup>	70.1 <sup>36</sup>	14.16 <sup>8</sup>	50.8 <sup>3</sup>	35.41 <sup>4</sup>	
Dec. 6.0	31.21 <sup>11</sup>	28.2 <sup>22</sup>	48.68 <sup>3</sup>	66.4 <sup>37</sup>	14.30 <sup>14</sup>	50.6 <sup>2</sup>	35.50 <sup>9</sup>	
	15	24	12	37	19	0	15	
15.9	31.36	25.8	48.80	62.7	14.49	50.6	35.65	
25.9	31.56 <sup>20</sup>	23.4 <sup>24</sup>	49.01 <sup>21</sup>	59.1 <sup>36</sup>	14.72 <sup>23</sup>	50.8 <sup>2</sup>	35.83 <sup>18</sup>	
35.9	31.79 <sup>23</sup>	21.0 <sup>24</sup>	49.30 <sup>29</sup>	55.7 <sup>34</sup>	15.00 <sup>28</sup>	51.2 <sup>4</sup>	36.06 <sup>23</sup>	
Sec $\delta$ , Tan $\delta$	1.032	+0.253	2.110	+1.857	1.115	-0.493	1.076	
Mean Place	29°.321	41''.60	50°.274	82''.83	11°.574	39''.44	33°.876	
D $\psi$ $\alpha$ , D $\omega$ $\alpha$	-0.01	+0.01	-0.04	+0.05	+0.01	-0.01	-0.01	
D $\psi$ $\delta$ , D $\omega$ $\delta$	-0.2	-0.9	-0.2	-0.9	-0.2	-0.9	-0.2	

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	λ Ophiuchi. Mag. 3.8		A Draconis. Mag. 5.0		τ Scorpii. Mag. 2.9		σ Herculis. Mag. 4.2	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 16 26 s + 2 9 "	° ' "	h m 16 28 s + 68 56 "	° ' "	h m 16 30 s - 28 2 "	° ' "	h m 16 31 s + 42 36 "	° ' "
1. 0.9	36.92	59.0	5.85	48.6	34.55	30.7	20.69	25.4
10.9	37.18 <sup>26</sup>	57.1 <sup>19</sup>	6.25 <sup>40</sup>	45.3 <sup>33</sup>	34.85 <sup>30</sup>	31.1 <sup>4</sup>	20.96 <sup>27</sup>	22.3 <sup>31</sup>
20.9	37.46 <sup>28</sup>	55.3 <sup>18</sup>	6.73 <sup>48</sup>	42.4 <sup>29</sup>	35.18 <sup>33</sup>	31.6 <sup>5</sup>	21.26 <sup>30</sup>	19.5 <sup>28</sup>
30.8	37.76 <sup>30</sup>	53.7 <sup>16</sup>	7.29 <sup>56</sup>	40.1 <sup>23</sup>	35.52 <sup>34</sup>	32.2 <sup>6</sup>	21.60 <sup>34</sup>	17.1 <sup>24</sup>
4. 9.8	38.07 <sup>31</sup>	52.3 <sup>14</sup>	7.91 <sup>62</sup>	38.3 <sup>18</sup>	35.88 <sup>36</sup>	32.9 <sup>7</sup>	21.96 <sup>36</sup>	15.2 <sup>19</sup>
	31	12	64	12	36	8	36	13
19.8	38.38	51.1	8.55	37.1	36.24	33.7	22.32	13.9
5. 1.7	38.69 <sup>31</sup>	50.2 <sup>9</sup>	9.21 <sup>66</sup>	36.7 <sup>4</sup>	36.60 <sup>36</sup>	34.5 <sup>8</sup>	22.69 <sup>37</sup>	13.2 <sup>7</sup>
11.7	38.99 <sup>30</sup>	49.7 <sup>5</sup>	9.86 <sup>65</sup>	36.9 <sup>2</sup>	36.95 <sup>35</sup>	35.3 <sup>8</sup>	23.05 <sup>36</sup>	13.1 <sup>1</sup>
21.7	39.28 <sup>29</sup>	49.5 <sup>2</sup>	10.48 <sup>62</sup>	37.8 <sup>9</sup>	37.28 <sup>33</sup>	36.0 <sup>7</sup>	23.40 <sup>35</sup>	13.6 <sup>5</sup>
31.7	39.55 <sup>27</sup>	49.6 <sup>1</sup>	11.05 <sup>57</sup>	39.3 <sup>15</sup>	37.60 <sup>32</sup>	36.7 <sup>7</sup>	23.72 <sup>32</sup>	14.7 <sup>11</sup>
	25	4	50	20	29	7	30	16
10.6	39.80	50.0	11.55	41.3	37.89	37.4	24.02	16.3
20.6	40.03 <sup>23</sup>	50.7 <sup>7</sup>	11.97 <sup>42</sup>	43.8 <sup>25</sup>	38.16 <sup>27</sup>	38.1 <sup>7</sup>	24.28 <sup>26</sup>	18.4 <sup>21</sup>
30.6	40.24 <sup>21</sup>	51.6 <sup>9</sup>	12.31 <sup>34</sup>	46.7 <sup>29</sup>	38.41 <sup>25</sup>	38.7 <sup>6</sup>	24.50 <sup>22</sup>	20.9 <sup>25</sup>
4. 10.6	40.42 <sup>18</sup>	52.6 <sup>10</sup>	12.55 <sup>24</sup>	49.9 <sup>32</sup>	38.63 <sup>22</sup>	39.2 <sup>5</sup>	24.68 <sup>18</sup>	23.6 <sup>27</sup>
20.5	40.57 <sup>15</sup>	53.8 <sup>12</sup>	12.68 <sup>13</sup>	53.2 <sup>33</sup>	38.82 <sup>19</sup>	39.8 <sup>6</sup>	24.82 <sup>14</sup>	26.5 <sup>29</sup>
	12	12	4	33	16	5	9	30
30.5	40.69	55.0	12.72	56.5	38.98	40.3	24.91	29.5
6. 9.5	40.78 <sup>9</sup>	56.3 <sup>13</sup>	12.65 <sup>7</sup>	59.7 <sup>32</sup>	39.10 <sup>12</sup>	40.7 <sup>4</sup>	24.96 <sup>5</sup>	32.4 <sup>29</sup>
19.4	40.84 <sup>6</sup>	57.5 <sup>12</sup>	12.49 <sup>16</sup>	62.8 <sup>31</sup>	39.18 <sup>8</sup>	41.2 <sup>5</sup>	24.96 <sup>0</sup>	35.3 <sup>29</sup>
29.4	40.86 <sup>2</sup>	58.7 <sup>12</sup>	12.23 <sup>26</sup>	65.7 <sup>29</sup>	39.22 <sup>4</sup>	41.5 <sup>3</sup>	24.91 <sup>5</sup>	37.9 <sup>26</sup>
4. 9.4	40.85 <sup>1</sup>	59.8 <sup>11</sup>	11.88 <sup>35</sup>	68.2 <sup>25</sup>	39.22 <sup>0</sup>	41.9 <sup>4</sup>	24.82 <sup>9</sup>	40.3 <sup>24</sup>
	5	10	42	22	4	2	14	21
19.4	40.80	60.8	11.46	70.4	39.18	42.1	24.68	42.4
29.3	40.73 <sup>7</sup>	61.7 <sup>9</sup>	10.97 <sup>49</sup>	72.1 <sup>17</sup>	39.10 <sup>8</sup>	42.3 <sup>2</sup>	24.51 <sup>17</sup>	44.2 <sup>18</sup>
5. 8.3	40.62 <sup>11</sup>	62.4 <sup>7</sup>	10.43 <sup>54</sup>	73.3 <sup>12</sup>	38.99 <sup>11</sup>	42.4 <sup>1</sup>	24.30 <sup>21</sup>	45.5 <sup>13</sup>
18.3	40.49 <sup>13</sup>	63.0 <sup>6</sup>	9.84 <sup>59</sup>	74.1 <sup>8</sup>	38.85 <sup>14</sup>	42.4 <sup>0</sup>	24.07 <sup>23</sup>	46.4 <sup>9</sup>
28.3	40.34 <sup>15</sup>	63.4 <sup>4</sup>	9.22 <sup>62</sup>	74.3 <sup>2</sup>	38.69 <sup>16</sup>	42.2 <sup>2</sup>	23.82 <sup>25</sup>	46.9 <sup>5</sup>
	16	2	63	3	17	3	26	0
1. 7.2	40.18	63.6	8.59	74.0	38.52	41.9	23.56	46.9
17.2	40.03 <sup>15</sup>	63.6 <sup>0</sup>	7.96 <sup>63</sup>	73.2 <sup>8</sup>	38.35 <sup>17</sup>	41.5 <sup>4</sup>	23.29 <sup>27</sup>	46.4 <sup>5</sup>
27.2	39.88 <sup>15</sup>	63.5 <sup>1</sup>	7.35 <sup>61</sup>	71.9 <sup>13</sup>	38.18 <sup>17</sup>	41.0 <sup>5</sup>	23.04 <sup>25</sup>	45.4 <sup>10</sup>
7. 7.1	39.74 <sup>14</sup>	63.2 <sup>3</sup>	6.78 <sup>57</sup>	70.1 <sup>18</sup>	38.03 <sup>15</sup>	40.4 <sup>6</sup>	22.80 <sup>24</sup>	44.0 <sup>14</sup>
17.1	39.63 <sup>11</sup>	62.6 <sup>6</sup>	6.27 <sup>51</sup>	67.8 <sup>23</sup>	37.92 <sup>11</sup>	39.8 <sup>6</sup>	22.60 <sup>20</sup>	42.2 <sup>18</sup>
	8	8	44	26	8	7	17	22
27.1	39.55	61.8	5.83	65.2	37.84	39.1	22.43	40.0
6. 6.1	39.52 <sup>3</sup>	60.9 <sup>9</sup>	5.48 <sup>35</sup>	62.1 <sup>31</sup>	37.81 <sup>3</sup>	38.5 <sup>6</sup>	22.31 <sup>12</sup>	37.4 <sup>26</sup>
16.0	39.53 <sup>1</sup>	59.7 <sup>12</sup>	5.23 <sup>25</sup>	58.7 <sup>34</sup>	37.83 <sup>2</sup>	38.0 <sup>5</sup>	22.25 <sup>6</sup>	34.5 <sup>29</sup>
26.0	39.59 <sup>6</sup>	58.3 <sup>14</sup>	5.09 <sup>14</sup>	55.1 <sup>36</sup>	37.91 <sup>8</sup>	37.5 <sup>5</sup>	22.25 <sup>0</sup>	31.3 <sup>32</sup>
4. 6.0	39.70 <sup>11</sup>	56.7 <sup>16</sup>	5.07 <sup>2</sup>	51.4 <sup>37</sup>	38.04 <sup>13</sup>	37.2 <sup>3</sup>	22.31 <sup>6</sup>	27.9 <sup>34</sup>
	16	17	10	37	19	1	12	34
16.0	39.86	55.0	5.17	47.7	38.23	37.1	22.43	24.5
25.9	40.06 <sup>20</sup>	53.2 <sup>18</sup>	5.39 <sup>22</sup>	44.0 <sup>37</sup>	38.46 <sup>23</sup>	37.1 <sup>0</sup>	22.61 <sup>18</sup>	21.1 <sup>34</sup>
35.9	40.30 <sup>24</sup>	51.4 <sup>18</sup>	5.72 <sup>33</sup>	40.6 <sup>34</sup>	38.74 <sup>28</sup>	37.4 <sup>3</sup>	22.84 <sup>23</sup>	17.9 <sup>32</sup>
Tan δ	1.001	+0.038	2.784	+2.598	1.133	-0.533	1.359	+0.920
Place	37°.506	68''.98	8°.583	67''.41	35°.282	26''.34	21°.748	41''.87
D <sub>∞</sub> α	0.00	0.00	-0.06	+0.07	+0.01	-0.01	-0.02	+0.02
D <sub>∞</sub> δ	-0.2	-0.9	-0.2	-0.9	-0.2	-0.9	-0.2	-0.9



FOR THE UPPER TRANSIT AT WASHINGTON.



FOR THE UPPER TRANSIT AT WASHINGTON.





FOR THE UPPER TRANSIT AT WASHINGTON.



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\lambda$ Scorpii. Mag. 1.7		$\beta$ Draconis. Mag. 3.0		$\alpha$ Ophiuchi. Mag. 2.1		$\epsilon$ Serpentis. Mag. 3.6	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 17 27 s	° ' " -37 2 "	h m 17 28 s	° ' " +52 21 "	h m 17 30 s	° ' " +12 36 "	h m 17 32 s	° ' " -15 20 "
Jan. 1.0	49.15	39.2	28.89	36.5	58.47	65.2	42.33	52.7
10.9	49.42 <sup>27</sup>	38.6 <sup>6</sup>	29.09 <sup>20</sup>	33.1 <sup>34</sup>	58.67 <sup>20</sup>	63.0 <sup>22</sup>	42.55 <sup>22</sup>	53.4 <sup>7</sup>
20.9	49.73 <sup>31</sup>	38.2 <sup>4</sup>	29.35 <sup>26</sup>	29.9 <sup>32</sup>	58.90 <sup>23</sup>	61.0 <sup>20</sup>	42.81 <sup>26</sup>	54.1 <sup>7</sup>
30.9	50.07 <sup>34</sup>	38.0 <sup>2</sup>	29.67 <sup>32</sup>	27.1 <sup>28</sup>	59.16 <sup>26</sup>	59.1 <sup>19</sup>	43.09 <sup>28</sup>	54.8 <sup>7</sup>
Feb. 9.8	50.43 <sup>36</sup> 38	37.8 <sup>2</sup> 0	30.03 <sup>36</sup> 38	24.7 <sup>24</sup> 19	59.44 <sup>28</sup> 29	57.4 <sup>17</sup> 13	43.39 <sup>30</sup> 31	55.5 <sup>7</sup> 6
19.8	50.81	37.8	30.41	22.8	59.73	56.1	43.70	56.1
Mar. 1.8	51.20 <sup>39</sup>	37.9 <sup>1</sup>	30.82 <sup>41</sup>	21.6 <sup>12</sup>	60.03 <sup>30</sup>	55.2 <sup>9</sup>	44.02 <sup>32</sup>	56.5 <sup>4</sup>
11.8	51.58 <sup>38</sup>	38.1 <sup>2</sup>	31.24 <sup>42</sup>	21.1 <sup>5</sup>	60.34 <sup>31</sup>	54.7 <sup>5</sup>	44.34 <sup>32</sup>	56.9 <sup>4</sup>
21.7	51.96 <sup>38</sup>	38.4 <sup>3</sup>	31.65 <sup>41</sup>	21.1 <sup>0</sup>	60.64 <sup>30</sup>	54.6 <sup>1</sup>	44.66 <sup>32</sup>	57.1 <sup>2</sup>
31.7	52.34 <sup>38</sup> 36	38.8 <sup>4</sup> 4	32.05 <sup>40</sup> 39	21.9 <sup>8</sup> 13	60.93 <sup>29</sup> 29	54.9 <sup>3</sup> 7	44.97 <sup>31</sup> 30	57.1 <sup>0</sup> 1
Apr. 10.7	52.70	39.2	32.44	23.2	61.22	55.6	45.27	57.0
20.7	53.04 <sup>34</sup>	39.7 <sup>5</sup>	32.79 <sup>35</sup>	25.1 <sup>19</sup>	61.49 <sup>27</sup>	56.7 <sup>11</sup>	45.56 <sup>29</sup>	56.7 <sup>3</sup>
30.6	53.37 <sup>33</sup>	40.2 <sup>5</sup>	33.10 <sup>31</sup>	27.5 <sup>24</sup>	61.74 <sup>25</sup>	58.1 <sup>14</sup>	45.83 <sup>27</sup>	56.4 <sup>3</sup>
May 10.6	53.67 <sup>30</sup>	40.8 <sup>6</sup>	33.37 <sup>27</sup>	30.2 <sup>27</sup>	61.97 <sup>23</sup>	59.7 <sup>16</sup>	46.08 <sup>25</sup>	55.9 <sup>5</sup>
20.6	53.93 <sup>26</sup> 24	41.5 <sup>7</sup> 7	33.59 <sup>22</sup> 16	33.3 <sup>31</sup> 32	62.17 <sup>20</sup> 17	61.5 <sup>18</sup> 20	46.31 <sup>23</sup> 20	55.4 <sup>5</sup> 5
30.5	54.17	42.2	33.75	36.5	62.34	63.5	46.51	54.9
June 9.5	54.36 <sup>19</sup>	43.0 <sup>8</sup>	33.86 <sup>11</sup>	39.8 <sup>33</sup>	62.48 <sup>14</sup>	65.5 <sup>20</sup>	46.67 <sup>16</sup>	54.5 <sup>4</sup>
19.5	54.51 <sup>15</sup>	43.9 <sup>9</sup>	33.91 <sup>5</sup>	43.1 <sup>33</sup>	62.58 <sup>10</sup>	67.5 <sup>20</sup>	46.81 <sup>14</sup>	54.0 <sup>5</sup>
29.5	54.61 <sup>10</sup>	44.7 <sup>8</sup>	33.89 <sup>2</sup>	46.2 <sup>31</sup>	62.65 <sup>7</sup>	69.4 <sup>19</sup>	46.90 <sup>9</sup>	53.6 <sup>4</sup>
July 9.4	54.67 <sup>6</sup> 1	45.5 <sup>8</sup> 8	33.82 <sup>7</sup> 13	49.2 <sup>30</sup> 28	62.68 <sup>3</sup> 1	71.2 <sup>18</sup> 16	46.95 <sup>5</sup> 1	53.2 <sup>4</sup> 4
19.4	54.68	46.3	33.69	52.0	62.67	72.8	46.96	52.8
29.4	54.63 <sup>5</sup> 8	47.0 <sup>7</sup> 6	33.51 <sup>18</sup>	54.4 <sup>24</sup>	62.62 <sup>5</sup>	74.3 <sup>15</sup>	46.93 <sup>3</sup>	52.5 <sup>3</sup>
Aug. 8.4	54.55 <sup>8</sup>	47.6 <sup>6</sup>	33.28 <sup>23</sup>	56.5 <sup>21</sup>	62.53 <sup>9</sup>	75.6 <sup>13</sup>	46.86 <sup>7</sup>	52.3 <sup>2</sup>
18.3	54.42 <sup>13</sup>	48.1 <sup>5</sup>	33.00 <sup>28</sup>	58.1 <sup>16</sup>	62.41 <sup>12</sup>	76.6 <sup>10</sup>	46.76 <sup>10</sup>	52.1 <sup>2</sup>
28.3	54.26 <sup>16</sup> 19	48.4 <sup>3</sup> 2	32.69 <sup>31</sup> 33	59.3 <sup>12</sup> 6	62.27 <sup>14</sup> 16	77.4 <sup>8</sup> 5	46.63 <sup>13</sup> 15	51.9 <sup>2</sup> 1
Sept. 7.3	54.07	48.6	32.36	59.9	62.11	77.9	46.48	51.8
17.2	53.87 <sup>20</sup>	48.5 <sup>1</sup>	32.01 <sup>35</sup>	60.1 <sup>2</sup>	61.93 <sup>18</sup>	78.1 <sup>2</sup>	46.32 <sup>16</sup>	51.6 <sup>2</sup>
27.2	53.67 <sup>20</sup>	48.2 <sup>3</sup>	31.66 <sup>35</sup>	59.8 <sup>3</sup>	61.75 <sup>18</sup>	78.0 <sup>1</sup>	46.15 <sup>17</sup>	51.5 <sup>1</sup>
Oct. 7.2	53.47 <sup>20</sup>	47.8 <sup>4</sup>	31.32 <sup>34</sup>	59.0 <sup>8</sup>	61.58 <sup>17</sup>	77.7 <sup>3</sup>	45.99 <sup>16</sup>	51.4 <sup>1</sup>
17.2	53.30 <sup>17</sup> 14	47.1 <sup>7</sup> 8	31.00 <sup>32</sup> 28	57.7 <sup>13</sup> 18	61.43 <sup>15</sup> 13	77.0 <sup>7</sup> 9	45.85 <sup>14</sup> 12	51.4 <sup>0</sup> 1
27.1	53.16	46.3	30.72	55.9	61.30	76.1	45.73	51.3
Nov. 6.1	53.07 <sup>9</sup>	45.4 <sup>9</sup>	30.48 <sup>24</sup>	53.6 <sup>23</sup>	61.20 <sup>10</sup>	74.9 <sup>12</sup>	45.65 <sup>8</sup>	51.4 <sup>1</sup>
16.1	53.03 <sup>4</sup>	44.4 <sup>10</sup>	30.30 <sup>18</sup>	50.9 <sup>27</sup>	61.15 <sup>5</sup>	73.4 <sup>15</sup>	45.61 <sup>4</sup>	51.5 <sup>1</sup>
26.1	53.04 <sup>1</sup>	43.4 <sup>10</sup>	30.18 <sup>12</sup>	47.9 <sup>30</sup>	61.14 <sup>1</sup>	71.7 <sup>17</sup>	45.62 <sup>1</sup>	51.7 <sup>2</sup>
Dec. 6.0	53.12 <sup>8</sup> 14	42.5 <sup>9</sup> 9	30.13 <sup>5</sup> 2	44.6 <sup>33</sup> 34	61.18 <sup>4</sup> 8	69.8 <sup>19</sup> 21	45.68 <sup>6</sup> 11	52.1 <sup>4</sup> 4
16.0	53.26	41.6	30.15	41.2	61.26	67.7	45.79	52.5 <sup>6</sup>
26.0	53.45 <sup>19</sup>	40.8 <sup>8</sup>	30.24 <sup>9</sup>	37.7 <sup>35</sup>	61.39 <sup>13</sup>	65.6 <sup>21</sup>	45.95 <sup>16</sup>	53.1 <sup>6</sup>
35.9	53.69 <sup>24</sup>	40.1 <sup>7</sup>	30.41 <sup>17</sup>	34.2 <sup>35</sup>	61.57 <sup>18</sup>	63.4 <sup>22</sup>	46.15 <sup>20</sup>	53.7 <sup>6</sup>
Tan $\delta$	1.253	-0.755	1.638	+1.297	1.025	+0.224	1.037	-0.274
Place	50°.090	33''.95	30°.684	49''.93	59°.290	75''.66	43°.076	45''.12
D <sub>a</sub>	+0.02	-0.01	-0.03	+0.01	-0.01	0.00	+0.01	0.00
D <sub><math>\delta</math></sub>	-0.1	-1.0	-0.1	-1.0	-0.1	-1.0	0.0	-1.0

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FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\iota^1$ Scorpii. Mag. 3.1			$\mu$ Herculis. Mag. 3.5			$\psi$ Draconis. Mag. 4.9			$\gamma$ Ophiuchi. Mag. 3.7		
	Right Ascension.		Declina- tion S.	Right Ascension.		Declina- tion N.	Right Ascension.		Declina- tion N.	Right Ascension.		Declina- tion N.
	h	m	° ' "	h	m	° ' "	h	m	° ' "	h	m	° ' "
	17	41	— 40 5	17	43	+ 27 45	17	43	+ 72 10	17	43	+ 2 44
	s		"	s		"	s		"	s		"
Jan. 1.0	37.37		48.1	6.83		59.8	22.39		74.6	37.02		9.1
10.9	37.63	26	47.2 9	7.01	18	57.0 28	22.61	22	71.0 36	37.22	20	7.5 16
20.9	37.94	31	46.5 7	7.23	22	54.3 27	22.96	35	67.7 33	37.45	23	5.9 16
30.9	38.28	34	46.0 5	7.48	25	51.9 24	23.43	47	64.8 29	37.70	25	4.4 15
Feb. 9.9	38.65	37	45.6 4	7.76	28	49.8 21	24.00	57	62.3 25	37.97	27	3.1 13
		38	2		30	17		64	20		29	10
19.8	39.03		45.4	8.06		48.1	24.64		60.3	38.26		2.1
Mar. 1.8	39.42	39	45.3 1	8.37	31	46.9 12	25.35	71	58.9 14	38.55	29	1.3 8
11.8	39.82	40	45.3 0	8.69	32	46.3 6	26.09	74	58.2 7	38.86	31	0.8 5
21.7	40.22	40	45.4 1	9.00	31	46.2 1	26.84	75	58.2 0	39.16	30	0.7 1
31.7	40.61	39	45.6 2	9.31	31	46.6 4	27.57	73	58.8 6	39.45	29	0.9 2
		39	4		30	9		69	12		29	6
Apr. 10.7	41.00		46.0	9.61		47.5	28.26		60.0	39.74		1.5
20.7	41.36	36	46.4 4	9.90	29	48.9 14	28.90	64	61.9 19	40.02	28	2.3 8
30.6	41.71	35	46.9 5	10.17	27	50.7 18	29.45	55	64.2 23	40.28	26	3.4 11
May 10.6	42.03	32	47.6 7	10.41	24	52.8 21	29.91	46	67.0 28	40.52	24	4.6 12
20.6	42.32	29	48.3 7	10.62	21	55.2 24	30.27	36	70.1 31	40.73	21	6.0 14
		26	8		17	26		24	32		19	15
30.6	42.58		49.1	10.79		57.8	30.51		73.3	40.92		7.5
June 9.5	42.80	22	50.0 9	10.93	14	60.5 27	30.63	12	76.7 34	41.08	16	9.1 16
19.5	42.97	17	50.9 9	11.04	11	63.1 26	30.63	0	80.2 35	41.21	13	10.6 15
29.5	43.09	12	51.9 10	11.10	6	65.7 26	30.51	12	83.5 33	41.30	9	12.1 15
July 9.4	43.16	7	52.9 10	11.11	1	68.2 25	30.27	24	86.6 31	41.35	5	13.5 14
		2	10		2	22		35	30		1	12
19.4	43.18		53.9	11.09		70.4	29.92		89.6	41.36		14.7
29.4	43.15	3	54.8 9	11.02	7	72.5 21	29.46	46	92.2 26	41.32	4	15.8 11
Aug. 8.4	43.07	8	55.5 7	10.91	11	74.2 17	28.91	55	94.4 22	41.26	6	16.8 10
18.3	42.94	13	56.2 7	10.77	14	75.6 14	28.28	63	96.3 19	41.16	10	17.6 8
28.3	42.77	17	56.7 5	10.60	17	76.8 12	27.58	70	97.6 13	41.03	13	18.2 6
		19	3		20	7		74	9		15	5
Sept. 7.3	42.58		57.0	10.40		77.5	26.84		98.5	40.88		18.7
17.3	42.37	21	57.0 0	10.19	21	77.8 3	26.07	77	98.9 4	40.71	17	18.9 2
27.2	42.16	21	56.8 2	9.98	21	77.7 1	25.29	78	98.7 2	40.54	17	18.9 0
Oct. 7.2	41.95	21	56.4 4	9.77	21	77.3 4	24.52	77	98.0 7	40.38	16	18.8 1
17.2	41.76	19	55.8 6	9.58	19	76.4 9	23.78	74	96.8 12	40.23	15	18.4 4
		15	8		17	13		68	17		13	6
27.1	41.61		55.0	9.41		75.1	23.10		95.1	40.10		17.8
Nov. 6.1	41.50	11	54.0 10	9.28	13	73.5 16	22.49	61	92.9 22	40.01	9	17.1 7
16.1	41.44	6	52.9 11	9.18	10	71.5 20	21.97	52	90.3 26	39.95	6	16.1 10
26.1	41.44	0	51.7 12	9.13	5	69.2 23	21.57	40	87.3 30	39.94	1	14.9 12
Dec. 6.0	41.50	6	50.6 11	9.14	1	66.7 25	21.29	28	84.0 33	39.98	4	13.6 13
		12	11		5	27		15	35		8	15
16.0	41.62		49.5	9.19		64.0	21.14		80.5	40.06		12.1
26.0	41.80	18	48.4 11	9.29	10	61.2 28	21.13	1	76.9 36	40.19	13	10.5 16
35.9	42.03	23	47.5 9	9.44	15	58.3 29	21.26	13	73.4 35	40.36	17	8.9 16
Dec $\delta$ , Tan $\delta$	1.307		— 0.842	1.130		+ 0.527	3.269		+ 3.112	1.001		+ 0.048
Mean Place	38°.363		42'' .51	7°.878		70'' .86	26°.806		87'' .12	37°.798		18'' .38
$D_\delta a$ , $D_\delta a$	+ 0.02		0.00	— 0.01		0.00	— 0.08		+ 0.01	0.00		0.00
$D_\delta \delta$ , $D_\delta \delta$	0.0		— 1.0	0.0		— 1.0	0.0		— 1.0	0.0		— 1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	89 Herculis. Mag. 5.5		ε Draconis. Mag. 3.9		35 Draconis. Mag. 5.0		θ Herculis. Mag. 4.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m	° '	h m	° '	h m	° '	h m	° '
	17 51	+26 3	17 52	+56 52	17 53	+76 58	17 53	+37 15
Jan. 1.0	58.43	35.6	1.38	56.9	8.82	17.8	18.97	29.1
10.9	58.60 <sup>17</sup>	32.9 <sup>27</sup>	1.55 <sup>17</sup>	53.4 <sup>35</sup>	9.03 <sup>21</sup>	14.4 <sup>34</sup>	19.14 <sup>17</sup>	26.0 <sup>31</sup>
20.9	58.81 <sup>21</sup>	30.3 <sup>26</sup>	1.79 <sup>24</sup>	50.1 <sup>33</sup>	9.42 <sup>39</sup>	11.1 <sup>33</sup>	19.35 <sup>21</sup>	23.1 <sup>29</sup>
30.9	59.06 <sup>25</sup>	27.9 <sup>24</sup>	2.09 <sup>30</sup>	47.1 <sup>30</sup>	9.98 <sup>56</sup>	8.1 <sup>30</sup>	19.60 <sup>25</sup>	20.4 <sup>27</sup>
Feb. 9.9	59.33 <sup>27</sup>	25.9 <sup>20</sup>	2.45 <sup>36</sup>	44.5 <sup>26</sup>	10.68 <sup>70</sup>	5.5 <sup>26</sup>	19.88 <sup>28</sup>	18.1 <sup>23</sup>
19.8	59.62 <sup>29</sup>	24.3 <sup>16</sup>	2.85 <sup>40</sup>	42.4 <sup>24</sup>	11.51 <sup>83</sup>	3.5 <sup>20</sup>	20.19 <sup>31</sup>	16.2 <sup>29</sup>
Mar. 1.8	59.93 <sup>31</sup>	23.1 <sup>12</sup>	3.28 <sup>43</sup>	41.0 <sup>14</sup>	12.42 <sup>91</sup>	2.0 <sup>15</sup>	20.52 <sup>33</sup>	14.9 <sup>13</sup>
11.8	60.24 <sup>31</sup>	22.4 <sup>7</sup>	3.72 <sup>44</sup>	40.2 <sup>8</sup>	13.39 <sup>97</sup>	1.2 <sup>8</sup>	20.86 <sup>34</sup>	14.1 <sup>8</sup>
21.7	60.55 <sup>31</sup>	22.2 <sup>2</sup>	4.18 <sup>46</sup>	40.0 <sup>2</sup>	14.38 <sup>99</sup>	1.1 <sup>1</sup>	21.20 <sup>34</sup>	14.0 <sup>1</sup>
31.7	60.86 <sup>31</sup>	22.6 <sup>4</sup>	4.63 <sup>45</sup>	40.5 <sup>5</sup>	15.35 <sup>97</sup>	1.6 <sup>5</sup>	21.53 <sup>33</sup>	14.4 <sup>4</sup>
Apr. 10.7	61.16 <sup>30</sup>	23.5 <sup>9</sup>	5.06 <sup>43</sup>	41.7 <sup>12</sup>	16.28 <sup>93</sup>	2.7 <sup>11</sup>	21.86 <sup>33</sup>	15.4 <sup>10</sup>
20.7	61.45 <sup>29</sup>	24.9 <sup>14</sup>	5.46 <sup>40</sup>	43.4 <sup>17</sup>	17.13 <sup>85</sup>	4.5 <sup>18</sup>	22.17 <sup>31</sup>	16.9 <sup>15</sup>
30.6	61.72 <sup>27</sup>	26.7 <sup>18</sup>	5.82 <sup>36</sup>	45.7 <sup>23</sup>	17.88 <sup>75</sup>	6.7 <sup>22</sup>	22.46 <sup>29</sup>	18.9 <sup>20</sup>
May 10.6	61.97 <sup>25</sup>	28.7 <sup>20</sup>	6.14 <sup>32</sup>	48.4 <sup>27</sup>	18.50 <sup>62</sup>	9.4 <sup>27</sup>	22.72 <sup>26</sup>	21.3 <sup>24</sup>
20.6	62.19 <sup>22</sup>	31.1 <sup>24</sup>	6.41 <sup>27</sup>	51.4 <sup>30</sup>	18.98 <sup>48</sup>	12.4 <sup>30</sup>	22.94 <sup>22</sup>	24.0 <sup>27</sup>
30.6	62.38 <sup>19</sup>	33.6 <sup>25</sup>	6.61 <sup>20</sup>	54.6 <sup>32</sup>	19.31 <sup>33</sup>	15.7 <sup>33</sup>	23.13 <sup>19</sup>	26.8 <sup>24</sup>
June 9.5	62.53 <sup>15</sup>	36.2 <sup>26</sup>	6.76 <sup>15</sup>	58.0 <sup>34</sup>	19.47 <sup>16</sup>	19.0 <sup>33</sup>	23.28 <sup>15</sup>	29.8 <sup>29</sup>
19.5	62.64 <sup>11</sup>	38.9 <sup>27</sup>	6.83 <sup>7</sup>	61.4 <sup>34</sup>	19.46 <sup>1</sup>	22.4 <sup>34</sup>	23.38 <sup>10</sup>	32.9 <sup>31</sup>
29.5	62.71 <sup>7</sup>	41.5 <sup>26</sup>	6.84 <sup>1</sup>	64.7 <sup>33</sup>	19.29 <sup>17</sup>	25.8 <sup>34</sup>	23.44 <sup>6</sup>	35.8 <sup>29</sup>
July 9.4	62.74 <sup>3</sup>	43.9 <sup>24</sup>	6.78 <sup>6</sup>	67.9 <sup>32</sup>	18.96 <sup>33</sup>	29.0 <sup>32</sup>	23.45 <sup>1</sup>	38.7 <sup>29</sup>
19.4	62.73 <sup>1</sup>	46.2 <sup>23</sup>	6.65 <sup>13</sup>	70.9 <sup>30</sup>	18.47 <sup>49</sup>	32.0 <sup>30</sup>	23.41 <sup>4</sup>	41.7 <sup>26</sup>
29.4	62.67 <sup>6</sup>	48.3 <sup>21</sup>	6.46 <sup>19</sup>	73.6 <sup>27</sup>	17.84 <sup>63</sup>	34.7 <sup>27</sup>	23.33 <sup>27</sup>	44.6 <sup>22</sup>
Aug. 8.4	62.57 <sup>10</sup>	50.1 <sup>18</sup>	6.21 <sup>25</sup>	75.9 <sup>23</sup>	17.08 <sup>76</sup>	37.0 <sup>23</sup>	23.20 <sup>23</sup>	47.5 <sup>17</sup>
18.3	62.44 <sup>13</sup>	51.5 <sup>14</sup>	5.91 <sup>30</sup>	77.9 <sup>20</sup>	16.21 <sup>87</sup>	39.0 <sup>20</sup>	23.03 <sup>20</sup>	50.4 <sup>12</sup>
28.3	62.28 <sup>16</sup>	52.7 <sup>12</sup>	5.57 <sup>34</sup>	79.4 <sup>15</sup>	15.25 <sup>96</sup>	40.5 <sup>15</sup>	22.83 <sup>15</sup>	53.3 <sup>7</sup>
Sept. 7.3	62.09 <sup>19</sup>	53.5 <sup>8</sup>	5.20 <sup>37</sup>	80.4 <sup>10</sup>	14.23 <sup>102</sup>	41.5 <sup>10</sup>	22.60 <sup>10</sup>	56.2 <sup>2</sup>
17.3	61.89 <sup>20</sup>	53.9 <sup>4</sup>	4.80 <sup>40</sup>	80.9 <sup>5</sup>	13.16 <sup>107</sup>	42.0 <sup>5</sup>	22.36 <sup>24</sup>	59.1 <sup>3</sup>
27.2	61.68 <sup>21</sup>	53.9 <sup>0</sup>	4.40 <sup>40</sup>	80.9 <sup>0</sup>	12.07 <sup>109</sup>	42.0 <sup>0</sup>	22.11 <sup>25</sup>	62.0 <sup>6</sup>
Oct. 7.2	61.48 <sup>20</sup>	53.6 <sup>3</sup>	4.00 <sup>40</sup>	80.4 <sup>5</sup>	10.99 <sup>108</sup>	41.5 <sup>5</sup>	21.87 <sup>24</sup>	64.9 <sup>4</sup>
17.2	61.29 <sup>19</sup>	52.9 <sup>7</sup>	3.62 <sup>38</sup>	79.4 <sup>10</sup>	9.95 <sup>104</sup>	40.5 <sup>10</sup>	21.64 <sup>23</sup>	67.8 <sup>9</sup>
27.1	61.12 <sup>17</sup>	51.7 <sup>12</sup>	3.27 <sup>35</sup>	77.8 <sup>16</sup>	8.97 <sup>98</sup>	39.0 <sup>15</sup>	21.43 <sup>21</sup>	70.7 <sup>13</sup>
Nov. 6.1	60.98 <sup>14</sup>	50.2 <sup>15</sup>	2.97 <sup>30</sup>	75.8 <sup>20</sup>	8.09 <sup>88</sup>	36.9 <sup>21</sup>	21.26 <sup>17</sup>	73.6 <sup>17</sup>
16.1	60.89 <sup>9</sup>	48.4 <sup>18</sup>	2.72 <sup>25</sup>	73.3 <sup>25</sup>	7.32 <sup>77</sup>	34.5 <sup>24</sup>	21.13 <sup>13</sup>	76.5 <sup>12</sup>
26.1	60.84 <sup>5</sup>	46.3 <sup>21</sup>	2.53 <sup>19</sup>	70.5 <sup>28</sup>	6.70 <sup>62</sup>	31.7 <sup>28</sup>	21.05 <sup>8</sup>	79.4 <sup>7</sup>
Dec. 6.0	60.83 <sup>1</sup>	43.9 <sup>24</sup>	2.42 <sup>11</sup>	67.3 <sup>32</sup>	6.23 <sup>47</sup>	28.5 <sup>32</sup>	21.02 <sup>3</sup>	82.3 <sup>2</sup>
16.0	60.88 <sup>5</sup>	41.3 <sup>26</sup>	2.39 <sup>3</sup>	63.9 <sup>34</sup>	5.95 <sup>28</sup>	25.1 <sup>34</sup>	21.04 <sup>2</sup>	85.2 <sup>2</sup>
26.0	60.98 <sup>10</sup>	38.6 <sup>27</sup>	2.43 <sup>4</sup>	60.4 <sup>35</sup>	5.85 <sup>10</sup>	21.6 <sup>35</sup>	21.12 <sup>8</sup>	88.1 <sup>31</sup>
36.0	61.12 <sup>14</sup>	35.8 <sup>28</sup>	2.55 <sup>12</sup>	56.9 <sup>35</sup>	5.94 <sup>9</sup>	18.1 <sup>35</sup>	21.26 <sup>14</sup>	91.0 <sup>31</sup>
Sec δ, Tan δ	1.113	+0.489	1.830	+1.533	4.436	+4.322	1.256	+0.761
Mean Place	59° 46' 9"	46° 13'	3° 60' 8"	68° 48'	15° 17' 9"	29° 41'	20° 26' 3"	40° 07'
D <sub>α</sub> α, D <sub>α</sub> α	-0.01	0.00	-0.04	0.00	-0.11	+0.01	-0.02	0.00
D <sub>δ</sub> δ, D <sub>δ</sub> δ	0.0	-1.0	0.0	-1.0	0.0	-1.0	0.0	-1.0





FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\theta$ Arct.		$\gamma$ Sagittarii.		70 Ophiuchi.		72 Ophiuchi.	
	Mag. 3.9		Mag. 3.1		Mag. 4.1		Mag. 3.7	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m	° '	h m	° '	h m	° '	h m	° '
	17 59	-50 5	18 0	-30 25	18 1	+ 2 30	18 3	+ 0 1
	s	"	s	"	s	"	s	"
Jan. 1.0	59 58	60.4	19.92	41.1	8.70	57.0	18.31	46.1
10.9	59.86 28	58.9 15	20.15 23	40.8 3	8.88 18	55.4 16	18.48 17	45.2
20.9	60.19 33	57.5 14	20.40 25	40.5 3	9.09 21	53.8 16	18.69 21	44.7
30.9	60.57 38	56.4 11	20.69 29	40.3 2	9.33 24	52.4 14	18.92 23	44.6
Feb. 9.9	60.97 40	55.4 10	21.01 32	40.1 2	9.59 26	51.1 13	19.18 26	44.9
	44	8	33	1	28	10	28	
19.8	61.41	54.6	21.34	40.0	9.87	50.1	19.46	46.1
Mar. 1.8	61.86 45	54.1 5	21.69 35	39.9 1	10.16 29	49.3 8	19.74 28	45.2
11.8	62.32 46	53.7 4	22.04 35	39.9 0	10.46 30	48.8 5	20.04 30	44.7
21.8	62.79 47	53.6 1	22.40 36	39.8 1	10.76 30	48.7 1	20.34 30	44.6
31.7	63.26 47	53.7 1	22.75 35	39.8 0	11.06 30	48.9 2	20.64 30	44.9
	45	2	35	0	30	5	29	
Apr. 10.7	63.71	53.9	23.10	39.8	11.36	49.4	20.93	45.5
20.7	64.15 44	54.4 5	23.44 34	39.8 0	11.64 28	50.2 8	21.21 28	46.3
30.6	64.57 42	55.1 7	23.76 32	39.8 0	11.91 27	51.3 11	21.48 27	47.6
May 10.6	64.96 39	55.9 8	24.06 30	39.8 0	12.16 25	52.6 13	21.74 26	49.4
20.6	65.32 36	56.9 10	24.34 28	39.9 1	12.39 23	54.0 14	21.97 23	51.1
	32	12	25	2	21	15	20	
30.6	65.64	58.1	24.59	40.1	12.60	55.5	22.17	53.0
June 9.5	65.91 27	59.5 14	24.81 22	40.4 3	12.78 18	57.1 16	22.34 17	55.0
19.5	66.13 22	60.9 14	24.98 17	40.7 3	12.92 14	58.6 15	22.48 14	56.9 19
29.5	66.29 16	62.4 15	25.11 13	41.1 4	13.02 10	60.1 15	22.58 10	58.8 19
July 9.5	66.38 9	63.9 15	25.20 9	41.5 4	13.09 7	61.5 14	22.64 6	60.6 18
	4	15	4	5	2	13	3	17
19.4	66.42	65.4	25.24	42.0	13.11	62.8	22.66	62.3
29.4	66.39 3	66.8 14	25.23 1	42.4 4	13.10 1	63.9 11	22.63 3	63.8 15
Aug. 8.4	66.30 9	68.1 13	25.18 5	42.9 5	13.04 6	64.9 10	22.57 6	65.1 13
18.3	66.16 14	69.2 11	25.08 10	43.3 4	12.95 9	65.7 8	22.47 10	66.2 11
28.3	65.97 19	70.0 8	24.95 13	43.6 3	12.83 12	66.4 7	22.34 13	67.0 8
	23	6	16	2	15	4	15	6
Sept. 7.3	65.74	70.6	24.79	43.8	12.68	66.8	22.19	67.6
17.3	65.49 25	70.9 3	24.61 18	43.9 1	12.52 16	67.0 2	22.03 16	68.0 4
27.2	65.22 27	70.9 0	24.42 19	43.9 0	12.35 17	67.1 1	21.85 18	68.1 1
Oct. 7.2	64.96 26	70.6 3	24.23 19	43.7 2	12.19 16	67.0 1	21.68 17	67.9 2
17.2	64.72 24	69.9 7	24.06 17	43.4 3	12.03 16	66.6 4	21.52 16	67.5 4
	21	10	14	4	13	5	15	7
27.2	64.51	68.9	23.92	43.0	11.90	66.1	21.37	66.8
Nov. 6.1	64.35 16	67.7 12	23.81 11	42.5 5	11.80 10	65.3 8	21.26 11	65.9 9
16.1	64.25 10	66.2 15	23.74 7	41.9 6	11.73 7	64.4 9	21.18 8	64.7 12
26.1	64.21 4	64.6 16	23.73 1	41.3 6	11.71 2	63.3 11	21.15 3	63.3 14
Dec. 6.0	64.24 3	62.9 17	23.76 3	40.7 6	11.73 2	62.0 13	21.16 1	61.7 16
	11	17	9	6	6	15	6	18
16.0	64.35	61.2	23.85	40.1	11.79	60.5	21.22	59.9
26.0	64.52 17	59.5 17	24.00 15	39.6 5	11.90 11	59.0 15	21.32 10	58.0 19
36.0	64.76 24	57.9 16	24.19 19	39.2 4	12.06 16	57.4 16	21.46 14	56.1 19
Sec $\delta$ , Tan $\delta$	1 559	-1.196	1.160	-0.587	1.001	+0.044	1.014	+0.168
Mean Place	60°.826	54'' .70	20°.778	34'' .24	9°.496	65'' .91	10°.161	63'' .65
$D\phi a$ , $D_{\omega} a$	+0.03	0.00	+0.02	0.00	0.00	0.00	0.00	0.00
$D\phi \delta$ , $D_{\omega} \delta$	0.0	-1.0	0.0	-1.0	0.0	-1.0	0.0	-1.0

(Eph 15)

FOR THE UPPER TRANSIT AT WASHINGTON.

n Solar Date.	o Hercules. Mag. 3.8		μ Sagittarii. Mag. 4.0		η Sagittarii. Mag. 3.2		Groombridge 2533. Mag. 5.4	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 18 4	° ' " + 28 44	h m 18 8	° ' " − 21 4	h m 18 11	° ' " − 36 47	h m 18 12	° ' " + 42 7
	s	"	s	"	s	"	s	"
l. 1.0	12.47	50.2	39.98	63.0	51.65	23.8	58.61	37.6
11.0	12.62 <sup>15</sup>	47.4 <sup>28</sup>	40.18 <sup>20</sup>	63.1 <sup>1</sup>	51.87 <sup>22</sup>	23.0 <sup>8</sup>	58.75 <sup>14</sup>	34.4 <sup>32</sup>
20.9	12.82 <sup>20</sup>	44.7 <sup>27</sup>	40.41 <sup>23</sup>	63.3 <sup>2</sup>	52.13 <sup>26</sup>	22.3 <sup>7</sup>	58.94 <sup>19</sup>	31.3 <sup>31</sup>
30.9	13.05 <sup>23</sup>	42.3 <sup>24</sup>	40.67 <sup>26</sup>	63.5 <sup>2</sup>	52.43 <sup>30</sup>	21.7 <sup>6</sup>	59.18 <sup>24</sup>	28.4 <sup>29</sup>
b. 9.9	13.32 <sup>27</sup>	40.1 <sup>22</sup>	40.96 <sup>29</sup>	63.7 <sup>2</sup>	52.76 <sup>33</sup>	21.1 <sup>6</sup>	59.45 <sup>27</sup>	25.9 <sup>25</sup>
19.8	13.61	38.4	41.26	63.9	53.11	20.7	59.76	23.9 <sup>1</sup>
r. 1.8	13.91 <sup>30</sup>	37.1 <sup>13</sup>	41.58 <sup>32</sup>	64.0 <sup>1</sup>	53.47 <sup>36</sup>	20.3 <sup>4</sup>	60.09 <sup>33</sup>	22.3 <sup>16</sup>
11.8	14.22 <sup>31</sup>	36.4 <sup>7</sup>	41.91 <sup>33</sup>	64.0 <sup>0</sup>	53.85 <sup>38</sup>	20.1 <sup>2</sup>	60.44 <sup>35</sup>	21.4 <sup>9</sup>
21.8	14.54 <sup>32</sup>	36.1 <sup>3</sup>	42.23 <sup>32</sup>	63.9 <sup>1</sup>	54.22 <sup>37</sup>	19.9 <sup>2</sup>	60.80 <sup>36</sup>	21.1 <sup>3</sup>
31.7	14.86 <sup>32</sup>	36.5 <sup>4</sup>	42.56 <sup>33</sup>	63.8 <sup>1</sup>	54.60 <sup>38</sup>	19.7 <sup>2</sup>	61.15 <sup>35</sup>	21.4 <sup>3</sup>
r. 10.7	15.17	37.3	42.89	63.5	54.98	19.7	61.50	22.3
20.7	15.47 <sup>30</sup>	38.7 <sup>14</sup>	43.20 <sup>31</sup>	63.2 <sup>3</sup>	55.34 <sup>36</sup>	19.7 <sup>0</sup>	61.84 <sup>34</sup>	23.7 <sup>14</sup>
30.7	15.75 <sup>28</sup>	40.5 <sup>18</sup>	43.50 <sup>30</sup>	62.8 <sup>4</sup>	55.70 <sup>36</sup>	19.8 <sup>1</sup>	62.15 <sup>31</sup>	25.7 <sup>20</sup>
y 10.6	16.01 <sup>26</sup>	42.6 <sup>21</sup>	43.79 <sup>29</sup>	62.5 <sup>3</sup>	56.03 <sup>33</sup>	20.0 <sup>2</sup>	62.44 <sup>29</sup>	28.0 <sup>23</sup>
20.6	16.24 <sup>23</sup>	45.0 <sup>24</sup>	44.05 <sup>26</sup>	62.1 <sup>4</sup>	56.34 <sup>31</sup>	20.4 <sup>4</sup>	62.69 <sup>25</sup>	30.7 <sup>27</sup>
30.6	16.43	47.6	44.29	61.7	56.61	20.8	62.91	33.7
ne 9.5	16.60 <sup>17</sup>	50.4 <sup>28</sup>	44.50 <sup>21</sup>	61.4 <sup>3</sup>	56.85 <sup>24</sup>	21.3 <sup>5</sup>	63.08 <sup>17</sup>	36.9 <sup>32</sup>
19.5	16.72 <sup>12</sup>	53.1 <sup>27</sup>	44.67 <sup>17</sup>	61.1 <sup>3</sup>	57.05 <sup>20</sup>	22.0 <sup>7</sup>	63.20 <sup>12</sup>	40.1 <sup>32</sup>
29.5	16.80 <sup>8</sup>	55.9 <sup>28</sup>	44.80 <sup>13</sup>	60.9 <sup>2</sup>	57.21 <sup>16</sup>	22.7 <sup>7</sup>	63.27 <sup>7</sup>	43.2 <sup>31</sup>
ly 9.5	16.84 <sup>4</sup>	58.5 <sup>26</sup>	44.89 <sup>9</sup>	60.8 <sup>1</sup>	57.31 <sup>10</sup>	23.5 <sup>8</sup>	63.29 <sup>2</sup>	46.3 <sup>31</sup>
19.4	16.83	60.9	44.94	60.7	57.36	24.3	63.26	49.2
29.4	16.77 <sup>6</sup>	63.2 <sup>23</sup>	44.94 <sup>0</sup>	60.7 <sup>0</sup>	57.36 <sup>0</sup>	25.1 <sup>8</sup>	63.18 <sup>8</sup>	51.8 <sup>26</sup>
g. 8.4	16.68 <sup>9</sup>	65.1 <sup>19</sup>	44.89 <sup>5</sup>	60.7 <sup>0</sup>	57.31 <sup>5</sup>	25.8 <sup>7</sup>	63.05 <sup>13</sup>	54.2 <sup>24</sup>
18.4	16.55 <sup>13</sup>	66.8 <sup>17</sup>	44.81 <sup>8</sup>	60.8 <sup>1</sup>	57.21 <sup>10</sup>	26.5 <sup>7</sup>	62.87 <sup>18</sup>	56.2 <sup>20</sup>
28.3	16.38 <sup>17</sup>	68.1 <sup>13</sup>	44.69 <sup>12</sup>	60.8 <sup>0</sup>	57.08 <sup>13</sup>	27.1 <sup>6</sup>	62.66 <sup>21</sup>	57.8 <sup>16</sup>
pt. 7.3	16.19	69.0	44.55 <sup>16</sup>	60.8	56.91	27.5	62.42	59.0
17.3	15.99 <sup>20</sup>	69.5 <sup>5</sup>	44.39 <sup>18</sup>	60.8	56.71 <sup>20</sup>	27.7	62.16 <sup>26</sup>	59.7 <sup>7</sup>
27.2	15.77 <sup>22</sup>	69.7 <sup>2</sup>	44.21 <sup>17</sup>	60.8	56.51 <sup>20</sup>	27.8	61.88 <sup>28</sup>	60.0 <sup>3</sup>
t. 7.2	15.56 <sup>21</sup>	69.4 <sup>3</sup>	44.04 <sup>16</sup>	60.8	56.30 <sup>21</sup>	27.6	61.61 <sup>27</sup>	59.8 <sup>2</sup>
17.2	15.36 <sup>20</sup>	68.8 <sup>6</sup>	43.88 <sup>14</sup>	60.7	56.11 <sup>19</sup>	27.3	61.35 <sup>26</sup>	59.1 <sup>7</sup>
27.2	15.18	67.7	43.74	60.5	55.95	26.8	61.11	57.9
v. 6.1	15.03 <sup>15</sup>	66.2 <sup>15</sup>	43.64 <sup>10</sup>	60.4	55.82 <sup>13</sup>	26.1	60.90 <sup>21</sup>	56.3 <sup>16</sup>
16.1	14.91 <sup>12</sup>	64.4 <sup>18</sup>	43.57 <sup>7</sup>	60.3	55.74 <sup>8</sup>	25.2	60.73 <sup>17</sup>	54.2 <sup>21</sup>
26.1	14.84 <sup>7</sup>	62.2 <sup>22</sup>	43.55 <sup>2</sup>	60.2	55.70 <sup>4</sup>	24.3	60.61 <sup>12</sup>	51.8 <sup>24</sup>
c. 6.1	14.82 <sup>2</sup>	59.8 <sup>24</sup>	43.58 <sup>3</sup>	60.1	55.73 <sup>3</sup>	23.4	60.55 <sup>6</sup>	49.0 <sup>28</sup>
16.0	14.85	57.2	43.66	60.1	55.81	22.4	60.54	46.0
26.0	14.93 <sup>8</sup>	54.4 <sup>28</sup>	43.78 <sup>12</sup>	60.1	55.94 <sup>13</sup>	21.5	60.59 <sup>5</sup>	42.8 <sup>32</sup>
36.0	15.06 <sup>13</sup>	51.6 <sup>28</sup>	43.95 <sup>17</sup>	60.2	56.13 <sup>19</sup>	20.6	60.69 <sup>10</sup>	39.6 <sup>32</sup>
l, Tan δ	1.141	+0.549	1.072	−0.386	1.249	−0.748	1.348	+0.904
1 Place	13°.580	60''.20	40°.760	55''.37	52°.576	16''.92	60°.119	47''.25
l, D <sub>∞</sub> α	−0.01	0.00	+0.01	0.00	+0.02	0.00	−0.02	0.00
, D <sub>∞</sub> δ	0.0	−1.0	0.0	−1.0	0.0	−1.0	0.0	−1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	36 Draconis. Mag. 5.0		δ Sagittarii. Mag. 2.8		η Serpentis. Mag. 3.4		ε Sagittarii. Mag. 2.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination S.
	h m 18 13	° ' " + 64 21	h m 18 15	° ' " − 29 51	h m 18 16	° ' " − 2 55	h m 18 18	° ' " − 34 25
Jan. 1.0	21.32	56.3	32.30	62.3	53.86	26.4	30.90	39.8
11.0	21.46 <sup>14</sup>	52.7 <sup>36</sup>	32.50 <sup>20</sup>	61.9 <sup>4</sup>	54.03 <sup>17</sup>	27.7 <sup>13</sup>	31.11 <sup>21</sup>	39.1 <sup>7</sup>
20.9	21.68 <sup>22</sup>	49.3 <sup>34</sup>	32.74 <sup>24</sup>	61.6 <sup>3</sup>	54.23 <sup>20</sup>	28.9 <sup>12</sup>	31.36 <sup>25</sup>	38.5 <sup>6</sup>
30.9	21.99 <sup>31</sup>	46.2 <sup>31</sup>	33.02 <sup>28</sup>	61.3 <sup>3</sup>	54.46 <sup>23</sup>	30.0 <sup>11</sup>	31.65 <sup>29</sup>	37.9 <sup>6</sup>
Feb. 9.9	22.37 <sup>38</sup>	43.4 <sup>28</sup>	33.32 <sup>30</sup>	61.0 <sup>3</sup>	54.71 <sup>25</sup>	31.0 <sup>10</sup>	31.96 <sup>31</sup>	37.4 <sup>5</sup>
19.8	22.82 <sup>45</sup>	41.1 <sup>23</sup>	33.64 <sup>32</sup>	60.8 <sup>2</sup>	54.98 <sup>27</sup>	31.8 <sup>8</sup>	32.29 <sup>33</sup>	37.0 <sup>4</sup>
Mar. 1.8	23.32 <sup>50</sup>	39.4 <sup>17</sup>	33.98 <sup>34</sup>	60.6 <sup>2</sup>	55.27 <sup>29</sup>	32.4 <sup>6</sup>	32.64 <sup>35</sup>	36.6 <sup>4</sup>
11.8	23.85 <sup>53</sup>	38.3 <sup>11</sup>	34.33 <sup>35</sup>	60.4 <sup>2</sup>	55.56 <sup>29</sup>	32.7 <sup>3</sup>	33.01 <sup>37</sup>	36.3 <sup>3</sup>
21.8	24.40 <sup>55</sup>	37.9 <sup>4</sup>	34.68 <sup>35</sup>	60.2 <sup>2</sup>	55.86 <sup>30</sup>	32.8 <sup>1</sup>	33.37 <sup>36</sup>	36.1 <sup>2</sup>
31.7	24.95 <sup>55</sup>	38.2 <sup>3</sup>	35.03 <sup>35</sup>	60.0 <sup>2</sup>	56.17 <sup>31</sup>	32.5 <sup>3</sup>	33.74 <sup>37</sup>	35.9 <sup>2</sup>
Apr. 10.7	25.49 <sup>54</sup>	39.1 <sup>9</sup>	35.38 <sup>35</sup>	59.8 <sup>2</sup>	56.47 <sup>30</sup>	32.0 <sup>5</sup>	34.11 <sup>37</sup>	35.7 <sup>1</sup>
20.7	25.99 <sup>50</sup>	40.7 <sup>16</sup>	35.72 <sup>34</sup>	59.7 <sup>1</sup>	56.76 <sup>29</sup>	31.3 <sup>7</sup>	34.47 <sup>36</sup>	35.6 <sup>0</sup>
30.7	26.46 <sup>47</sup>	42.8 <sup>21</sup>	36.05 <sup>33</sup>	59.5 <sup>2</sup>	57.04 <sup>28</sup>	30.3 <sup>10</sup>	34.81 <sup>34</sup>	35.6 <sup>0</sup>
May 10.6	26.87 <sup>41</sup>	45.3 <sup>25</sup>	36.36 <sup>31</sup>	59.4 <sup>1</sup>	57.30 <sup>26</sup>	29.2 <sup>11</sup>	35.14 <sup>33</sup>	35.7 <sup>1</sup>
20.6	27.21 <sup>34</sup>	48.3 <sup>30</sup>	36.65 <sup>29</sup>	59.4 <sup>0</sup>	57.55 <sup>25</sup>	28.0 <sup>12</sup>	35.45 <sup>31</sup>	35.8 <sup>1</sup>
30.6	27.48 <sup>27</sup>	51.5 <sup>32</sup>	36.91 <sup>26</sup>	59.5 <sup>1</sup>	57.77 <sup>22</sup>	26.7 <sup>13</sup>	35.72 <sup>27</sup>	36.1 <sup>3</sup>
June 9.5	27.67 <sup>19</sup>	54.9 <sup>34</sup>	37.14 <sup>23</sup>	59.6 <sup>1</sup>	57.96 <sup>19</sup>	25.4 <sup>13</sup>	35.97 <sup>25</sup>	36.5 <sup>4</sup>
19.5	27.77 <sup>10</sup>	58.4 <sup>35</sup>	37.33 <sup>19</sup>	59.8 <sup>2</sup>	58.12 <sup>16</sup>	24.0 <sup>14</sup>	36.17 <sup>20</sup>	36.9 <sup>4</sup>
29.5	27.79 <sup>2</sup>	61.8 <sup>34</sup>	37.48 <sup>15</sup>	60.1 <sup>3</sup>	58.24 <sup>12</sup>	22.8 <sup>12</sup>	36.32 <sup>15</sup>	37.5 <sup>6</sup>
July 9.5	27.72 <sup>7</sup>	65.2 <sup>34</sup>	37.58 <sup>10</sup>	60.5 <sup>4</sup>	58.32 <sup>8</sup>	21.6 <sup>12</sup>	36.43 <sup>11</sup>	38.1 <sup>6</sup>
19.4	27.57 <sup>15</sup>	68.4 <sup>32</sup>	37.64 <sup>6</sup>	60.9 <sup>4</sup>	58.36 <sup>4</sup>	20.5 <sup>11</sup>	36.49 <sup>6</sup>	38.8 <sup>7</sup>
29.4	27.33 <sup>24</sup>	71.3 <sup>29</sup>	37.65 <sup>1</sup>	61.3 <sup>4</sup>	58.36 <sup>0</sup>	19.6 <sup>9</sup>	36.50 <sup>1</sup>	39.5 <sup>7</sup>
Aug. 8.4	27.02 <sup>31</sup>	73.9 <sup>26</sup>	37.61 <sup>4</sup>	61.8 <sup>5</sup>	58.32 <sup>4</sup>	18.8 <sup>8</sup>	36.46 <sup>4</sup>	40.1 <sup>6</sup>
18.4	26.64 <sup>38</sup>	76.2 <sup>23</sup>	37.52 <sup>9</sup>	62.2 <sup>4</sup>	58.24 <sup>8</sup>	18.1 <sup>7</sup>	36.37 <sup>9</sup>	40.7 <sup>6</sup>
28.3	26.21 <sup>43</sup>	78.0 <sup>18</sup>	37.40 <sup>12</sup>	62.6 <sup>4</sup>	58.13 <sup>11</sup>	17.6 <sup>5</sup>	36.24 <sup>13</sup>	41.3 <sup>6</sup>
Sept. 7.3	25.73 <sup>48</sup>	79.3 <sup>13</sup>	37.25 <sup>15</sup>	62.8 <sup>2</sup>	57.99 <sup>14</sup>	17.2 <sup>4</sup>	36.08 <sup>16</sup>	41.7 <sup>4</sup>
17.3	25.22 <sup>51</sup>	80.2 <sup>9</sup>	37.07 <sup>18</sup>	63.0 <sup>2</sup>	57.83 <sup>16</sup>	17.0 <sup>2</sup>	35.90 <sup>18</sup>	41.9 <sup>2</sup>
27.2	24.69 <sup>53</sup>	80.5 <sup>3</sup>	36.89 <sup>18</sup>	63.0 <sup>0</sup>	57.67 <sup>16</sup>	16.9 <sup>1</sup>	35.70 <sup>20</sup>	42.0 <sup>1</sup>
Oct. 7.2	24.16 <sup>53</sup>	80.3 <sup>2</sup>	36.70 <sup>19</sup>	62.9 <sup>1</sup>	57.50 <sup>17</sup>	17.0 <sup>1</sup>	35.50 <sup>20</sup>	41.9 <sup>1</sup>
17.2	23.65 <sup>51</sup>	79.6 <sup>7</sup>	36.52 <sup>18</sup>	62.7 <sup>2</sup>	57.34 <sup>16</sup>	17.2 <sup>2</sup>	35.31 <sup>19</sup>	41.7 <sup>2</sup>
27.2	23.17 <sup>48</sup>	78.3 <sup>13</sup>	36.37 <sup>15</sup>	62.4 <sup>3</sup>	57.21 <sup>13</sup>	17.6 <sup>4</sup>	35.15 <sup>16</sup>	41.2 <sup>5</sup>
Nov. 6.1	22.73 <sup>44</sup>	76.5 <sup>18</sup>	36.25 <sup>12</sup>	62.0 <sup>4</sup>	57.10 <sup>11</sup>	18.1 <sup>5</sup>	35.02 <sup>13</sup>	40.7 <sup>5</sup>
16.1	22.35 <sup>38</sup>	74.3 <sup>22</sup>	36.17 <sup>8</sup>	61.5 <sup>5</sup>	57.02 <sup>8</sup>	18.8 <sup>7</sup>	34.94 <sup>8</sup>	40.0 <sup>7</sup>
26.1	22.05 <sup>30</sup>	71.6 <sup>27</sup>	36.14 <sup>3</sup>	60.9 <sup>6</sup>	56.99 <sup>3</sup>	19.6 <sup>8</sup>	34.90 <sup>4</sup>	39.2 <sup>8</sup>
Dec. 6.1	21.83 <sup>22</sup>	68.5 <sup>31</sup>	36.16 <sup>2</sup>	60.3 <sup>6</sup>	57.00 <sup>1</sup>	20.6 <sup>10</sup>	34.92 <sup>2</sup>	38.3 <sup>9</sup>
16.0	21.71 <sup>12</sup>	65.2 <sup>33</sup>	36.24 <sup>8</sup>	59.8 <sup>5</sup>	57.05 <sup>5</sup>	21.6 <sup>10</sup>	34.99 <sup>7</sup>	37.5 <sup>8</sup>
26.0	21.68 <sup>3</sup>	61.7 <sup>35</sup>	36.37 <sup>13</sup>	59.2 <sup>6</sup>	57.15 <sup>10</sup>	22.8 <sup>12</sup>	35.12 <sup>13</sup>	36.7 <sup>8</sup>
36.0	21.75 <sup>7</sup>	58.2 <sup>35</sup>	36.54 <sup>17</sup>	58.8 <sup>4</sup>	57.29 <sup>14</sup>	24.0 <sup>12</sup>	35.29 <sup>17</sup>	35.9 <sup>8</sup>
Sec δ, Tan δ	2.312	+2.084	1.153	−0.574	1.001	−0.051	1.212	−0.685
Mean Place	24°.460	65''.91	33°.142	55''.00	54°.642	18''.03	31°.792	32''.56
Dψ α, Dω α	−0.06	−0.01	+0.02	0.00	0.00	0.00	+0.02	0.00
Dψ δ, Dω δ	0.0	−1.0	0.0	−1.0	0.0	−1.0	0.0	−1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	100 Herculis. Mag. 3.9		$\alpha$ Telescopii. Mag. 3.8		$\chi$ Draconis. Mag. 3.7		$\lambda$ Sagittarii. Mag. 2.9	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 18 20 s	° ' " + 21 43 "	h m 18 20 s	° ' " - 46 0 "	h m 18 22 s	° ' " + 72 41 "	h m 18 22 s	° ' " - 25 28 "
n. 1.0	3.51	39.7	39.17	66.1	30.57	37.6	42.70	18.9
11.0	3.66 <sup>15</sup>	37.2 <sup>25</sup>	39.40 <sup>23</sup>	64.7 <sup>14</sup>	30.67 <sup>10</sup>	34.0 <sup>36</sup>	42.89 <sup>19</sup>	18.7 <sup>2</sup>
20.9	3.84 <sup>18</sup>	34.8 <sup>24</sup>	39.69 <sup>29</sup>	63.4 <sup>13</sup>	30.91 <sup>24</sup>	30.6 <sup>34</sup>	43.12 <sup>23</sup>	18.6 <sup>1</sup>
30.9	4.06 <sup>22</sup>	32.5 <sup>23</sup>	40.01 <sup>32</sup>	62.2 <sup>12</sup>	31.28 <sup>37</sup>	27.4 <sup>32</sup>	43.37 <sup>25</sup>	18.5 <sup>1</sup>
b. 9.9	4.31 <sup>25</sup>	30.5 <sup>20</sup>	40.37 <sup>36</sup>	61.2 <sup>10</sup>	31.77 <sup>49</sup>	24.6 <sup>28</sup>	43.66 <sup>29</sup>	18.4 <sup>1</sup>
	27	16	39	9	59	24	30	1
19.9	4.58	28.9	40.76	60.3	32.36	22.2	43.96	18.3
ar. 1.8	4.87 <sup>29</sup>	27.7 <sup>12</sup>	41.17 <sup>41</sup>	59.6 <sup>7</sup>	33.03 <sup>67</sup>	20.4 <sup>18</sup>	44.28 <sup>32</sup>	18.1 <sup>2</sup>
11.8	5.17 <sup>30</sup>	27.0 <sup>7</sup>	41.60 <sup>43</sup>	59.0 <sup>6</sup>	33.76 <sup>73</sup>	19.2 <sup>12</sup>	44.61 <sup>33</sup>	18.0 <sup>1</sup>
21.8	5.47 <sup>30</sup>	26.7 <sup>3</sup>	42.03 <sup>43</sup>	58.6 <sup>4</sup>	34.52 <sup>76</sup>	18.7 <sup>5</sup>	44.95 <sup>34</sup>	17.8 <sup>2</sup>
31.7	5.78 <sup>31</sup>	27.0 <sup>3</sup>	42.46 <sup>43</sup>	58.4 <sup>2</sup>	35.29 <sup>77</sup>	18.8 <sup>1</sup>	45.29 <sup>34</sup>	17.5 <sup>3</sup>
	30	7	43	0	75	8	34	3
r. 10.7	6.08	27.7	42.89	58.4	36.04	19.6	45.63	17.2
20.7	6.38 <sup>30</sup>	28.9 <sup>12</sup>	43.31 <sup>42</sup>	58.5 <sup>1</sup>	36.75 <sup>71</sup>	21.0 <sup>14</sup>	45.96 <sup>33</sup>	16.9 <sup>3</sup>
30.7	6.66 <sup>28</sup>	30.5 <sup>16</sup>	43.71 <sup>40</sup>	58.8 <sup>3</sup>	37.40 <sup>65</sup>	22.9 <sup>19</sup>	46.28 <sup>32</sup>	16.6 <sup>3</sup>
y 10.6	6.93 <sup>27</sup>	32.4 <sup>19</sup>	44.09 <sup>38</sup>	59.3 <sup>5</sup>	37.96 <sup>56</sup>	25.4 <sup>25</sup>	46.58 <sup>30</sup>	16.3 <sup>3</sup>
20.6	7.17 <sup>24</sup>	34.6 <sup>22</sup>	44.45 <sup>36</sup>	60.0 <sup>7</sup>	38.43 <sup>47</sup>	28.2 <sup>28</sup>	46.87 <sup>29</sup>	16.0 <sup>3</sup>
	21	23	32	8	37	32	25	2
30.6	7.38	36.9	44.77	60.8	38.80	31.4	47.12	15.8
ne 9.5	7.56 <sup>18</sup>	39.4 <sup>25</sup>	45.05 <sup>28</sup>	61.7 <sup>9</sup>	39.04 <sup>24</sup>	34.7 <sup>33</sup>	47.35 <sup>23</sup>	15.6 <sup>2</sup>
19.5	7.71 <sup>15</sup>	41.9 <sup>25</sup>	45.28 <sup>23</sup>	62.8 <sup>11</sup>	39.16 <sup>12</sup>	38.2 <sup>35</sup>	47.54 <sup>19</sup>	15.5 <sup>1</sup>
29.5	7.81 <sup>10</sup>	44.4 <sup>25</sup>	45.46 <sup>18</sup>	64.0 <sup>12</sup>	39.16 <sup>0</sup>	41.7 <sup>35</sup>	47.69 <sup>15</sup>	15.6 <sup>1</sup>
ly 9.5	7.87 <sup>6</sup>	46.8 <sup>24</sup>	45.58 <sup>12</sup>	65.3 <sup>13</sup>	39.02 <sup>14</sup>	45.1 <sup>34</sup>	47.80 <sup>11</sup>	15.7 <sup>1</sup>
	2	23	6	13	25	32	6	1
19.4	7.89	49.1	45.64	66.6	38.77	48.3	47.86	15.8
29.4	7.87 <sup>2</sup>	51.2 <sup>21</sup>	45.65 <sup>1</sup>	67.9 <sup>13</sup>	38.40 <sup>37</sup>	51.3 <sup>30</sup>	47.87 <sup>1</sup>	16.0 <sup>2</sup>
ig. 8.4	7.80 <sup>7</sup>	53.0 <sup>18</sup>	45.59 <sup>6</sup>	69.1 <sup>12</sup>	37.92 <sup>48</sup>	54.0 <sup>27</sup>	47.84 <sup>3</sup>	16.3 <sup>3</sup>
18.4	7.70 <sup>10</sup>	54.6 <sup>16</sup>	45.48 <sup>11</sup>	70.2 <sup>11</sup>	37.35 <sup>57</sup>	56.3 <sup>23</sup>	47.76 <sup>8</sup>	16.5 <sup>2</sup>
28.3	7.56 <sup>14</sup>	55.8 <sup>12</sup>	45.33 <sup>15</sup>	71.0 <sup>8</sup>	36.69 <sup>66</sup>	58.3 <sup>20</sup>	47.65 <sup>11</sup>	16.8 <sup>3</sup>
	17	9	20	7	72	14	15	2
ot. 7.3	7.39	56.7	45.13	71.7	35.97	59.7	47.50	17.0
17.3	7.21 <sup>18</sup>	57.3 <sup>6</sup>	44.90 <sup>23</sup>	72.2 <sup>5</sup>	35.20 <sup>77</sup>	60.7 <sup>10</sup>	47.34 <sup>16</sup>	17.1 <sup>1</sup>
27.2	7.02 <sup>19</sup>	57.6 <sup>3</sup>	44.66 <sup>24</sup>	72.4 <sup>2</sup>	34.40 <sup>80</sup>	61.2 <sup>5</sup>	47.16 <sup>18</sup>	17.2 <sup>1</sup>
t. 7.2	6.82 <sup>20</sup>	57.5 <sup>1</sup>	44.42 <sup>24</sup>	72.2 <sup>2</sup>	33.60 <sup>80</sup>	61.2 <sup>0</sup>	46.98 <sup>18</sup>	17.1 <sup>1</sup>
17.2	6.63 <sup>19</sup>	57.0 <sup>5</sup>	44.19 <sup>23</sup>	71.8 <sup>4</sup>	32.81 <sup>79</sup>	60.6 <sup>6</sup>	46.81 <sup>17</sup>	17.0 <sup>1</sup>
	17	8	20	7	75	12	14	2
27.2	6.46	56.2	43.99	71.1	32.06	59.4	46.67	16.8
v. 6.1	6.32 <sup>14</sup>	55.0 <sup>12</sup>	43.83 <sup>16</sup>	70.2 <sup>9</sup>	31.37 <sup>69</sup>	57.8 <sup>16</sup>	46.55 <sup>12</sup>	16.6 <sup>2</sup>
16.1	6.22 <sup>10</sup>	53.4 <sup>16</sup>	43.72 <sup>11</sup>	69.0 <sup>12</sup>	30.76 <sup>61</sup>	55.7 <sup>21</sup>	46.47 <sup>8</sup>	16.3 <sup>3</sup>
26.1	6.15 <sup>7</sup>	51.6 <sup>18</sup>	43.66 <sup>6</sup>	67.6 <sup>14</sup>	30.24 <sup>52</sup>	53.1 <sup>26</sup>	46.43 <sup>4</sup>	16.0 <sup>3</sup>
c. 6.1	6.13 <sup>2</sup>	49.5 <sup>21</sup>	43.67 <sup>1</sup>	66.2 <sup>14</sup>	29.84 <sup>40</sup>	50.2 <sup>29</sup>	46.45 <sup>2</sup>	15.7 <sup>3</sup>
	2	22	7	15	27	33	6	3
16.0	6.15 <sup>8</sup>	47.3	43.74	64.7	29.57	46.9	46.51	15.4
26.0	6.23 <sup>8</sup>	44.8 <sup>25</sup>	43.88 <sup>14</sup>	63.2 <sup>15</sup>	29.44 <sup>13</sup>	43.5 <sup>34</sup>	46.62 <sup>11</sup>	15.1 <sup>3</sup>
36.0	6.35 <sup>12</sup>	42.3 <sup>25</sup>	44.07 <sup>19</sup>	61.7 <sup>15</sup>	29.45 <sup>1</sup>	40.0 <sup>35</sup>	46.79 <sup>17</sup>	14.9 <sup>2</sup>
, Tan $\delta$	1.076	+0.399	1.440	-1.036	3.362	+3.209	1.108	-0.476
Place	4 <sup>s</sup> .529	48 <sup>''</sup> .57	40 <sup>s</sup> .265	59 <sup>''</sup> .17	35 <sup>s</sup> .509	46 <sup>''</sup> .21	43 <sup>s</sup> .506	11 <sup>''</sup> .22
, D <sub>aa</sub>	-0.01	0.00	+0.03	+0.01	-0.08	-0.02	+0.01	0.00
D <sub>a</sub> $\delta$	0.0	-1.0	0.0	-1.0	0.0	-1.0	0.0	-1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♎ Serpentis. Mag. 5.4		♏ Aquilæ. Mag. 4.1		♍ Pavonis. Mag. 4.1		α Lyre. (Vega.) Mag. 0.1	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 18 25 s	° ' " — 2 2 "	h m 18 30 s	° ' " — 8 18 "	h m 18 33 s	° ' " — 71 30 "	h m 18 34 s	° ' " + 38 41 "
Jan. 1.0	14.76	36.4	34.12	23.9	3.59	16.5	2.20	66.1
11.0	14.92 <sup>16</sup>	37.7 <sup>13</sup>	34.28 <sup>16</sup>	24.8 <sup>9</sup>	3.97 <sup>38</sup>	13.7 <sup>28</sup>	2.31 <sup>11</sup>	63.0 <sup>31</sup>
20.9	15.12 <sup>20</sup>	38.9 <sup>12</sup>	34.47 <sup>19</sup>	25.6 <sup>8</sup>	4.46 <sup>49</sup>	11.1 <sup>26</sup>	2.48 <sup>17</sup>	60.0 <sup>30</sup>
30.9	15.34 <sup>22</sup>	40.0 <sup>11</sup>	34.70 <sup>23</sup>	26.4 <sup>8</sup>	5.05 <sup>59</sup>	8.7 <sup>24</sup>	2.69 <sup>21</sup>	57.2 <sup>28</sup>
Feb. 9.9	15.59 <sup>25</sup>	41.0 <sup>10</sup>	34.95 <sup>25</sup>	27.1 <sup>7</sup>	5.73 <sup>68</sup>	6.6 <sup>21</sup>	2.94 <sup>25</sup>	54.7 <sup>25</sup>
	<sup>27</sup>	<sup>8</sup>	<sup>27</sup>	<sup>5</sup>	<sup>76</sup>	<sup>19</sup>	<sup>28</sup>	<sup>21</sup>
19.9	15.86	41.8	35.22	27.6	6.49	4.7	3.22	52.6
Mar. 1.8	16.14 <sup>28</sup>	42.4 <sup>6</sup>	35.51 <sup>29</sup>	28.0 <sup>4</sup>	7.30 <sup>81</sup>	3.2 <sup>15</sup>	3.53 <sup>31</sup>	51.0 <sup>10</sup>
11.8	16.43 <sup>29</sup>	42.7 <sup>3</sup>	35.80 <sup>29</sup>	28.1 <sup>1</sup>	8.15 <sup>85</sup>	2.1 <sup>11</sup>	3.86 <sup>33</sup>	49.9 <sup>11</sup>
21.8	16.73 <sup>30</sup>	42.7 <sup>0</sup>	36.11 <sup>31</sup>	28.1 <sup>0</sup>	9.03 <sup>88</sup>	1.4 <sup>7</sup>	4.20 <sup>34</sup>	49.5 <sup>4</sup>
31.7	17.03 <sup>30</sup>	42.4 <sup>3</sup>	36.41 <sup>30</sup>	27.8 <sup>3</sup>	9.91 <sup>88</sup>	1.0 <sup>4</sup>	4.54 <sup>34</sup>	49.6 <sup>1</sup>
	<sup>30</sup>	<sup>5</sup>	<sup>31</sup>	<sup>5</sup>	<sup>88</sup>	<sup>0</sup>	<sup>34</sup>	<sup>7</sup>
Apr. 10.7	17.33	41.9	36.72	27.3	10.79	1.0	4.88	50.3
20.7	17.63 <sup>30</sup>	41.1 <sup>8</sup>	37.02 <sup>30</sup>	26.6 <sup>7</sup>	11.65 <sup>86</sup>	1.4 <sup>4</sup>	5.22 <sup>34</sup>	51.6 <sup>13</sup>
30.7	17.91 <sup>28</sup>	40.1 <sup>10</sup>	37.31 <sup>29</sup>	25.7 <sup>9</sup>	12.48 <sup>83</sup>	2.2 <sup>8</sup>	5.54 <sup>32</sup>	53.4 <sup>18</sup>
May 10.6	18.18 <sup>27</sup>	38.9 <sup>12</sup>	37.59 <sup>28</sup>	24.8 <sup>9</sup>	13.26 <sup>78</sup>	3.4 <sup>12</sup>	5.83 <sup>29</sup>	55.6 <sup>22</sup>
20.6	18.43 <sup>25</sup>	37.6 <sup>13</sup>	37.85 <sup>26</sup>	23.7 <sup>11</sup>	13.97 <sup>71</sup>	4.8 <sup>14</sup>	6.10 <sup>27</sup>	58.2 <sup>26</sup>
	<sup>23</sup>	<sup>14</sup>	<sup>24</sup>	<sup>11</sup>	<sup>64</sup>	<sup>18</sup>	<sup>24</sup>	<sup>29</sup>
30.6	18.66	36.2	38.09	22.6	14.61	6.6	6.34	61.1
June 9.6	18.86 <sup>20</sup>	34.7 <sup>15</sup>	38.30 <sup>21</sup>	21.5 <sup>11</sup>	15.15 <sup>54</sup>	8.6 <sup>20</sup>	6.53 <sup>19</sup>	64.1 <sup>30</sup>
19.5	19.03 <sup>17</sup>	33.3 <sup>14</sup>	38.48 <sup>18</sup>	20.4 <sup>11</sup>	15.58 <sup>43</sup>	10.8 <sup>22</sup>	6.68 <sup>15</sup>	67.3 <sup>32</sup>
29.5	19.16 <sup>13</sup>	32.0 <sup>13</sup>	38.62 <sup>14</sup>	19.4 <sup>10</sup>	15.91 <sup>33</sup>	13.2 <sup>24</sup>	6.78 <sup>10</sup>	70.4 <sup>31</sup>
July 9.5	19.25 <sup>9</sup>	30.7 <sup>13</sup>	38.72 <sup>10</sup>	18.5 <sup>9</sup>	16.11 <sup>20</sup>	15.7 <sup>25</sup>	6.83 <sup>5</sup>	73.5 <sup>31</sup>
	<sup>4</sup>	<sup>12</sup>	<sup>5</sup>	<sup>9</sup>	<sup>8</sup>	<sup>24</sup>	<sup>0</sup>	<sup>29</sup>
19.4	19.29	29.5	38.77	17.6	16.19	18.1	6.83	76.4
29.4	19.30 <sup>1</sup>	28.5 <sup>10</sup>	38.79 <sup>2</sup>	16.9 <sup>7</sup>	16.14 <sup>5</sup>	20.5 <sup>24</sup>	6.79 <sup>4</sup>	79.1 <sup>27</sup>
Aug. 8.4	19.26 <sup>4</sup>	27.6 <sup>9</sup>	38.76 <sup>3</sup>	16.3 <sup>6</sup>	15.96 <sup>18</sup>	22.8 <sup>23</sup>	6.69 <sup>10</sup>	81.6 <sup>25</sup>
18.4	19.19 <sup>7</sup>	26.9 <sup>7</sup>	38.69 <sup>7</sup>	15.9 <sup>4</sup>	15.68 <sup>28</sup>	24.8 <sup>20</sup>	6.55 <sup>14</sup>	83.7 <sup>21</sup>
28.3	19.09 <sup>10</sup>	26.3 <sup>6</sup>	38.59 <sup>10</sup>	15.5 <sup>4</sup>	15.29 <sup>30</sup>	26.5 <sup>17</sup>	6.37 <sup>18</sup>	85.5 <sup>18</sup>
	<sup>14</sup>	<sup>4</sup>	<sup>13</sup>	<sup>2</sup>	<sup>48</sup>	<sup>13</sup>	<sup>21</sup>	<sup>13</sup>
Sept. 7.3	18.95	25.9	38.46	15.3	14.81	27.8	6.16	86.8
17.3	18.80 <sup>15</sup>	25.6 <sup>3</sup>	38.31 <sup>15</sup>	15.1 <sup>2</sup>	14.27 <sup>54</sup>	28.7 <sup>9</sup>	5.92 <sup>24</sup>	87.8 <sup>10</sup>
27.3	18.63 <sup>17</sup>	25.5 <sup>1</sup>	38.15 <sup>16</sup>	15.1 <sup>0</sup>	13.70 <sup>57</sup>	29.1 <sup>4</sup>	5.67 <sup>25</sup>	88.3 <sup>5</sup>
Oct. 7.2	18.47 <sup>10</sup>	25.6 <sup>1</sup>	37.98 <sup>17</sup>	15.1 <sup>0</sup>	13.11 <sup>59</sup>	29.0 <sup>1</sup>	5.42 <sup>25</sup>	88.3 <sup>0</sup>
17.2	18.31 <sup>16</sup>	25.8 <sup>2</sup>	37.82 <sup>10</sup>	15.2 <sup>1</sup>	12.54 <sup>57</sup>	28.4 <sup>6</sup>	5.17 <sup>25</sup>	87.9 <sup>4</sup>
	<sup>14</sup>	<sup>3</sup>	<sup>14</sup>	<sup>3</sup>	<sup>53</sup>	<sup>11</sup>	<sup>23</sup>	<sup>9</sup>
27.2	18.17	26.1	37.68	15.5	12.01	27.3	4.94	87.0
Nov. 6.1	18.05 <sup>12</sup>	26.6 <sup>5</sup>	37.57 <sup>11</sup>	15.8 <sup>3</sup>	11.56 <sup>45</sup>	25.8 <sup>15</sup>	4.73 <sup>21</sup>	85.7 <sup>13</sup>
16.1	17.98 <sup>7</sup>	27.3 <sup>7</sup>	37.48 <sup>0</sup>	16.2 <sup>4</sup>	11.20 <sup>36</sup>	23.8 <sup>20</sup>	4.56 <sup>17</sup>	83.9 <sup>18</sup>
26.1	17.94 <sup>4</sup>	28.1 <sup>8</sup>	37.44 <sup>4</sup>	16.7 <sup>5</sup>	10.95 <sup>25</sup>	21.5 <sup>23</sup>	4.44 <sup>12</sup>	81.7 <sup>22</sup>
Dec. 6.1	17.94 <sup>0</sup>	29.1 <sup>10</sup>	37.45 <sup>1</sup>	17.4 <sup>7</sup>	10.83 <sup>12</sup>	18.9 <sup>26</sup>	4.37 <sup>7</sup>	79.2 <sup>25</sup>
	<sup>5</sup>	<sup>11</sup>	<sup>4</sup>	<sup>7</sup>	<sup>2</sup>	<sup>28</sup>	<sup>2</sup>	<sup>28</sup>
16.0	17.90	30.2	37.40	18.1	10.85	16.1	4.35	76.4
26.0	18.08 <sup>0</sup>	31.3 <sup>11</sup>	37.58 <sup>0</sup>	18.9 <sup>8</sup>	11.00 <sup>15</sup>	13.3 <sup>28</sup>	4.37 <sup>2</sup>	73.4 <sup>30</sup>
30.0	18.21 <sup>13</sup>	32.0 <sup>13</sup>	37.72 <sup>14</sup>	19.7 <sup>8</sup>	11.29 <sup>20</sup>	10.5 <sup>28</sup>	4.46 <sup>9</sup>	70.4 <sup>30</sup>
See δ, Tan δ	1.001	−0.030	1.011	−0.140	3.152	−2.080	1.281	+0.801
Mean Place	15° 55'	28' 12"	34° 50'	15' 77"	0° 395	0° 66	3° 632	74° 11
D <sub>u</sub> δ, D <sub>u</sub> δ	0.00	0.00	0.00	0.00	−0.08	+0.03	−0.02	−0.01
D <sub>u</sub> δ, D <sub>u</sub> δ	0.0	1.0	−0.1	−1.0	−0.1	−1.0	+0.1	−1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	2 Aquilæ. Mag. 4.7		φ Sagittarii. Mag. 3.3		110 Herculis. Mag. 4.3		6 Aquilæ. Mag. 4.5	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 18 37 s	° ' " — 9 8 "	h m 18 40 s	° ' " — 27 4 "	h m 18 41 s	° ' " + 20 27 "	h m 18 42 s	° ' " — 4 50 "
n. 1.0	36.48	13.3	19.97	52.8	59.15	43.1	39.09	31.0
11.0	36.63 <sup>15</sup>	14.0 <sup>7</sup>	20.14 <sup>17</sup>	52.5 <sup>3</sup>	59.27 <sup>12</sup>	40.7 <sup>24</sup>	39.23 <sup>14</sup>	32.0 <sup>10</sup>
20.9	36.82 <sup>19</sup>	14.8 <sup>8</sup>	20.35 <sup>21</sup>	52.1 <sup>4</sup>	59.43 <sup>16</sup>	38.4 <sup>23</sup>	39.41 <sup>18</sup>	33.0 <sup>10</sup>
30.9	37.04 <sup>22</sup>	15.5 <sup>7</sup>	20.60 <sup>25</sup>	51.8 <sup>3</sup>	59.63 <sup>20</sup>	36.2 <sup>22</sup>	39.62 <sup>21</sup>	33.9 <sup>9</sup>
b. 9.9	37.29 <sup>25</sup> 26	16.1 <sup>6</sup> 5	20.87 <sup>27</sup> 30	51.5 <sup>3</sup> 3	59.86 <sup>23</sup> 25	34.3 <sup>19</sup> 16	39.86 <sup>24</sup> 26	34.7 <sup>8</sup> 6
19.9	37.55	16.6	21.17	51.2	60.11	32.7	40.12	35.3
r. 1.8	37.84 <sup>29</sup>	16.9 <sup>3</sup>	21.48 <sup>31</sup>	50.9 <sup>3</sup>	60.38 <sup>27</sup>	31.4 <sup>13</sup>	40.39 <sup>27</sup>	35.8 <sup>5</sup>
11.8	38.13 <sup>29</sup>	17.0 <sup>1</sup>	21.81 <sup>33</sup>	50.5 <sup>4</sup>	60.67 <sup>29</sup>	30.6 <sup>8</sup>	40.68 <sup>29</sup>	36.0 <sup>2</sup>
21.8	38.43 <sup>30</sup>	16.9 <sup>1</sup>	22.15 <sup>34</sup>	50.1 <sup>4</sup>	60.97 <sup>30</sup>	30.3 <sup>3</sup>	40.98 <sup>30</sup>	35.9 <sup>1</sup>
31.8	38.74 <sup>31</sup> 31	16.6 <sup>3</sup> 6	22.49 <sup>34</sup> 34	49.7 <sup>4</sup> 4	61.28 <sup>31</sup> 30	30.5 <sup>2</sup> 6	41.28 <sup>30</sup> 31	35.6 <sup>3</sup> 6
r. 10.7	39.05	16.0	22.83	49.3	61.58	31.1	41.59	35.0
20.7	39.35 <sup>30</sup>	15.3 <sup>7</sup>	23.17 <sup>34</sup>	48.8 <sup>5</sup>	61.88 <sup>30</sup>	32.2 <sup>11</sup>	41.89 <sup>30</sup>	34.2 <sup>8</sup>
30.7	39.65 <sup>30</sup>	14.4 <sup>9</sup>	23.50 <sup>33</sup>	48.4 <sup>4</sup>	62.18 <sup>30</sup>	33.7 <sup>15</sup>	42.18 <sup>29</sup>	33.2 <sup>10</sup>
y 10.6	39.93 <sup>28</sup>	13.4 <sup>10</sup>	23.82 <sup>32</sup>	48.0 <sup>4</sup>	62.45 <sup>27</sup>	35.6 <sup>19</sup>	42.46 <sup>28</sup>	32.0 <sup>12</sup>
20.6	40.20 <sup>27</sup> 24	12.3 <sup>11</sup> 11	24.12 <sup>30</sup> 28	47.7 <sup>3</sup> 3	62.71 <sup>26</sup> 23	37.7 <sup>21</sup> 23	42.73 <sup>27</sup> 24	30.8 <sup>12</sup> 14
30.6	40.44	11.2	24.40	47.4	62.94	40.0	42.97	29.4
ne 9.6	40.66 <sup>22</sup>	10.1 <sup>11</sup>	24.64 <sup>24</sup>	47.2 <sup>2</sup>	63.14 <sup>20</sup>	42.5 <sup>25</sup>	43.19 <sup>22</sup>	28.1 <sup>13</sup>
19.5	40.84 <sup>18</sup>	9.0 <sup>11</sup>	24.85 <sup>21</sup>	47.2 <sup>0</sup>	63.31 <sup>17</sup>	45.0 <sup>25</sup>	43.37 <sup>18</sup>	26.8 <sup>13</sup>
29.5	40.99 <sup>15</sup>	8.0 <sup>10</sup>	25.02 <sup>17</sup>	47.2 <sup>0</sup>	63.44 <sup>13</sup>	47.5 <sup>25</sup>	43.52 <sup>15</sup>	25.5 <sup>13</sup>
ly 9.5	41.10 <sup>11</sup> 6	7.1 <sup>9</sup> 8	25.15 <sup>13</sup> 8	47.3 <sup>1</sup> 3	63.52 <sup>8</sup> 4	49.9 <sup>24</sup> 23	43.63 <sup>11</sup> 6	24.3 <sup>12</sup> 10
19.5	41.16	6.3	25.23	47.6	63.56	52.2	43.69	23.3
29.4	41.18 <sup>2</sup>	5.7 <sup>6</sup>	25.26 <sup>3</sup>	47.9 <sup>3</sup>	63.56 <sup>0</sup>	54.3 <sup>21</sup>	43.72 <sup>3</sup>	22.4 <sup>9</sup>
g. 8.4	41.16 <sup>2</sup>	5.1 <sup>6</sup>	25.24 <sup>2</sup>	48.2 <sup>3</sup>	63.51 <sup>5</sup>	56.3 <sup>20</sup>	43.70 <sup>2</sup>	21.6 <sup>8</sup>
18.4	41.10 <sup>6</sup>	4.7 <sup>4</sup>	25.18 <sup>6</sup>	48.6 <sup>4</sup>	63.42 <sup>9</sup>	57.9 <sup>16</sup>	43.64 <sup>6</sup>	20.9 <sup>7</sup>
28.3	41.00 <sup>10</sup> 12	4.3 <sup>4</sup> 2	25.07 <sup>11</sup> 14	48.9 <sup>3</sup> 3	63.30 <sup>12</sup> 15	59.3 <sup>14</sup> 10	43.54 <sup>10</sup> 12	20.4 <sup>5</sup> 3
rt. 7.3	40.88	4.1	24.93	49.2	63.15	60.3	43.42	20.1
17.3	40.73 <sup>15</sup>	4.0 <sup>1</sup>	24.77 <sup>16</sup>	49.5 <sup>3</sup>	62.97 <sup>18</sup>	61.0 <sup>7</sup>	43.27 <sup>15</sup>	19.9 <sup>2</sup>
27.3	40.57 <sup>16</sup>	3.9 <sup>1</sup>	24.60 <sup>17</sup>	49.6 <sup>1</sup>	62.79 <sup>18</sup>	61.4 <sup>4</sup>	43.11 <sup>16</sup>	19.8 <sup>1</sup>
t. 7.2	40.40 <sup>17</sup>	4.0 <sup>1</sup>	24.41 <sup>19</sup>	49.7 <sup>1</sup>	62.59 <sup>20</sup>	61.4 <sup>0</sup>	42.94 <sup>17</sup>	19.8 <sup>0</sup>
17.2	40.24 <sup>16</sup> 14	4.1 <sup>1</sup> 2	24.24 <sup>17</sup> 16	49.6 <sup>1</sup> 1	62.40 <sup>19</sup> 17	61.1 <sup>3</sup> 6	42.78 <sup>16</sup> 14	19.9 <sup>1</sup> 3
27.2	40.10	4.3	24.08	49.5	62.23	60.5	42.64	20.2
v. 6.2	39.98 <sup>12</sup>	4.6 <sup>3</sup>	23.95 <sup>13</sup>	49.2 <sup>3</sup>	62.08 <sup>15</sup>	59.5 <sup>10</sup>	42.52 <sup>12</sup>	20.6 <sup>4</sup>
16.1	39.89 <sup>9</sup>	4.9 <sup>3</sup>	23.86 <sup>9</sup>	48.9 <sup>3</sup>	61.96 <sup>12</sup>	58.1 <sup>14</sup>	42.43 <sup>9</sup>	21.2 <sup>6</sup>
26.1	39.85 <sup>4</sup>	5.4 <sup>5</sup>	23.81 <sup>5</sup>	48.5 <sup>4</sup>	61.89 <sup>7</sup>	56.5 <sup>16</sup>	42.37 <sup>6</sup>	21.8 <sup>6</sup>
c. 6.1	39.84 <sup>1</sup> 5	6.0 <sup>6</sup> 6	23.80 <sup>1</sup> 5	48.1 <sup>4</sup> 4	61.85 <sup>4</sup> 0	54.6 <sup>19</sup> 21	42.36 <sup>1</sup> 4	22.6 <sup>8</sup> 9
16.0	39.89	6.6	23.85	47.7	61.85	52.5	42.40	23.5
26.0	39.97 <sup>8</sup>	7.3 <sup>7</sup>	23.95 <sup>10</sup>	47.3 <sup>4</sup>	61.90 <sup>5</sup>	50.2 <sup>23</sup>	42.48 <sup>8</sup>	24.4 <sup>9</sup>
36.0	40.10 <sup>13</sup>	8.1 <sup>8</sup>	24.09 <sup>14</sup>	46.9 <sup>4</sup>	62.00 <sup>10</sup>	47.8 <sup>24</sup>	42.60 <sup>12</sup>	25.4 <sup>10</sup>
, Tan δ	1.013	—0.161	1.123	—0.511	1.067	+0.373	1.004	—0.085
Place	37°.244	5''.20	20°.767	44''.82	60°.160	50''.89	39°.865	22''.95
, D <sub>α</sub>	0.00	0.00	+0.01	+0.01	—0.01	0.00	0.00	0.00
D <sub>α</sub> δ	+0.1	—1.0	+0.1	—1.0	+0.1	—1.0	+0.1	—1.0



**FOR THE UPPER TRANSIT AT WASHINGTON.**



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ε Aquilæ. Mag. 4.2		ζ Sagittarii. Mag. 2.7		ζ Aquilæ. Mag. 3.0		λ Aquilæ. Mag. 3.6	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 18 55 s	° ' " + 14 56 "	h m 18 57 s	° ' " − 30 0 "	h m 19 1 s	° ' " + 13 43 "	h m 19 1 s	° ' " − 5 0 "
Jan. 1.0	44.92	60.0	11.45	18.5	29.26	63.7	43.52	46.5
11.0	45.03 11	57.9 21	11.61 16	17.9 6	29.37 11	61.7 20	43.65 13	47.4 9
21.0	45.18 15	55.9 20	11.80 19	17.3 6	29.52 15	59.7 20	43.81 16	48.3 9
30.9	45.37 19	54.0 19	12.04 24	16.7 6	29.70 18	57.9 18	44.00 19	49.2 9
Feb. 9.9	45.59 22	52.3 17	12.30 26	16.1 6	29.91 21	56.2 17	44.22 22	49.9 7
	24	14	29	5	24	14	25	5
19.9	45.83	50.9	12.59	15.6	30.15	54.8	44.47	50.4
Mar. 1.8	46.09 26	49.8 11	12.90 31	15.0 6	30.41 26	53.8 10	44.73 26	50.8 4
11.8	46.37 28	49.1 7	13.23 33	14.4 6	30.68 27	53.1 7	45.01 28	50.9 1
21.8	46.66 29	48.8 3	13.57 34	13.8 6	30.97 29	52.9 2	45.30 29	50.8 1
31.8	46.96 30	49.0 2	13.92 35	13.2 6	31.27 30	53.1 2	45.60 30	50.4 4
	30	6	36	5	30	6	31	6
Apr. 10.7	47.26	49.6	14.28	12.7	31.57	53.7	45.91	49.8
20.7	47.56 30	50.6 10	14.63 35	12.1 6	31.87 30	54.7 10	46.21 30	48.9 9
30.7	47.85 29	52.0 14	14.97 34	11.6 5	32.17 30	56.0 13	46.51 30	47.9 10
May 10.7	48.14 29	53.7 17	15.31 34	11.2 4	32.45 28	57.7 17	46.80 29	46.7 12
20.6	48.40 26	55.7 20	15.63 32	10.8 4	32.72 27	59.6 19	47.08 28	45.3 14
	24	21	29	2	25	21	26	14
30.6	48.64	57.8	15.92	10.6	32.97	61.7	47.34	43.9
June 9.6	48.86 22	60.1 23	16.19 27	10.5 1	33.18 21	64.0 23	47.57 23	42.6 13
19.5	49.04 18	62.4 23	16.42 23	10.5 0	33.37 19	66.2 22	47.77 20	41.2 14
29.5	49.18 14	64.7 23	16.61 19	10.6 1	33.52 15	68.5 23	47.93 16	39.9 13
July 9.5	49.29 11	67.0 23	16.76 15	10.9 3	33.63 11	70.7 22	48.06 13	38.7 12
	6	21	9	4	7	21	8	11
19.5	49.35	69.1	16.85	11.3	33.70	72.8	48.14	37.6
29.4	49.36 1	71.0 19	16.90 5	11.7 4	33.72 2	74.7 19	48.18 4	36.6 10
Aug. 8.4	49.34 2	72.8 18	16.90 0	12.2 5	33.70 2	76.4 17	48.18 0	35.8 8
18.4	49.27 7	74.3 15	16.85 5	12.7 5	33.64 6	77.9 15	48.13 5	35.1 7
28.4	49.16 11	75.6 13	16.75 10	13.2 5	33.54 10	79.2 13	48.05 8	34.6 5
	13	10	13	5	13	10	12	4
Sept. 7.3	49.03	76.6	16.62	13.7	33.41	80.2	47.93	34.2
17.3	48.87 16	77.3 7	16.46 16	14.1 4	33.25 16	80.9 7	47.79 14	34.0 2
27.3	48.69 18	77.7 4	16.28 18	14.4 3	33.08 17	81.3 4	47.64 15	33.9 1
Oct. 7.2	48.51 18	77.8 1	16.09 19	14.5 1	32.90 18	81.4 1	47.47 17	33.9 0
17.2	48.33 18	77.6 2	15.91 18	14.5 0	32.73 17	81.2 2	47.31 16	34.1 2
	16	5	17	1	17	4	15	2
27.2	48.17	77.1	15.74	14.4	32.56	80.8	47.16	34.3
Nov. 6.2	48.02 15	76.2 9	15.60 14	14.2 2	32.42 14	80.0 8	47.03 13	34.7 4
16.1	47.91 11	75.1 11	15.49 11	13.8 4	32.30 12	78.9 11	46.93 10	35.2 5
26.1	47.83 8	73.8 13	15.42 7	13.3 5	32.22 8	77.6 13	46.87 6	35.8 6
Dec. 6.1	47.79 4	72.2 16	15.40 2	12.8 5	32.18 4	76.1 15	46.84 3	36.6 8
	0	19	3	6	0	17	2	8
16.1	47.79	70.3	15.43	12.2	32.18	74.4	46.86	37.4
26.0	47.84 5	68.4 19	15.51 8	11.6 6	32.22 4	72.5 19	46.92 6	38.3 9
36.0	47.92 8	66.3 21	15.63 12	11.0 6	32.30 8	70.5 20	47.02 10	39.2 9
Sec δ, Tan δ	1.035	+0.267	1.155	−0.577	1.029	+0.244	1.004	−0.088
Mean Place	45°.857	67''.23	12°.248	10''.14	30°.184	70''.69	44°.284	38''.72
D'ψ α, Dω α	−0.01	0.00	+0.01	+0.01	−0.01	0.00	0.00	0.00
Dψ δ, Dω δ	+0.1	−1.0	+0.1	−1.0	+0.1	−1.0	+0.1	−1.0

FOR THE UPPER TRANSIT AT WASHINGTON.

775204



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	κ Cygni. Mag. 4.0		τ Draconis. Mag. 4.6		δ Aquilæ. Mag. 3.4		β Cygni. Mag. 3.2	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 19 15	° ' + 53 12	h m 19 17	° ' + 73 11	h m 19 21	° ' + 2 56	h m 19 27	° ' + 27 46
Jan. 1.0	6.15	36.4	6.43	50.1	11.97	33.3	16.43	44.8
11.0	6.19 4	33.1 33	6.35 8	46.7 34	12.07 10	31.9 14	16.50 7	42.3 25
21.0	6.29 10	29.7 34	6.41 6	43.3 34	12.21 14	30.6 13	16.61 11	39.7 26
30.9	6.46 17	26.5 32	6.62 21	39.9 34	12.38 17	29.4 12	16.76 15	37.3 24
Feb. 9.9	6.69 23 28	23.6 29 26	6.96 34 47	36.8 31 28	12.58 20 22	28.3 11 9	16.95 19 22	35.0 23 19
19.9	6.97	21.0	7.43	34.0	12.80	27.4	17.17.	33.1
Mar. 1.9	7.30 33	18.8 22	8.00 57	31.7 23	13.05 25	26.8 6	17.42 25	31.5 16
11.8	7.66 36	17.2 16	8.66 66	29.9 18	13.32 27	26.4 4	17.69 27	30.4 11
21.8	8.06 40	16.2 10	9.39 73	28.7 12	13.60 28	26.4 0	17.98 29	29.8 6
31.8	8.47 41 42	15.9 3 3	10.16 77 78	28.1 6 1	13.89 29 30	26.8 4 6	18.29 31 31	29.7 1 4
Apr. 10.8	8.89	16.2	10.94	28.2	14.19	27.4	18.60	30.1
20.7	9.31 42	17.1 9	11.72 78	29.0 8	14.49 30	28.4 10	18.92 32	31.0 9
30.7	9.72 41	18.6 15	12.46 74	30.3 13	14.79 30	29.6 12	19.24 32	32.4 14
May 10.7	10.10 38	20.7 21	13.15 69	32.3 20	15.08 29	31.1 15	19.55 31	34.2 18
20.6	10.46 36 31	23.2 25 29	13.76 61 51	34.7 24 28	15.37 29 26	32.7 16 17	19.84 29 27	36.4 22 25
30.6	10.77	26.1	14.27	37.5	15.63	34.4	20.11	38.9
June 9.6	11.03 26	29.3 32	14.68 41	40.7 32	15.87 24	36.2 18	20.35 24	41.6 27
19.6	11.24 21	32.6 33	14.97 29	44.1 34	16.08 21	38.1 19	20.56 21	44.4 28
29.5	11.39 15	36.1 35	15.13 16	47.6 35	16.25 17	39.9 18	20.73 17	47.3 29
July 9.5	11.47 8 2	39.6 35 35	15.17 4 10	51.2 36 36	16.39 14 9	41.6 17 16	20.73 12 8	50.1 28 28
19.5	11.49	43.1	15.07	54.8	16.48	43.2	20.93	52.9
29.5	11.45 4	46.4 33	14.85 22	58.2 34	16.53 5	44.7 15	20.96 3	55.6 27
Aug. 8.4	11.34 11	49.4 30	14.50 35	61.4 32	16.54 1	45.9 12	20.94 2	58.0 24
18.4	11.17 17	52.2 28	14.04 46	64.4 30	16.51 3	47.0 11	20.88 6	60.2 22
28.4	10.94 23 27	54.7 25 20	13.48 56 65	67.0 26 23	16.44 7 11	47.9 9 7	20.78 10 14	62.1 19 16
Sept. 7.3	10.67	56.7	12.83	69.3	16.33	48.6	20.64	63.7
17.3	10.36 31	58.3 16	12.11 72	71.1 18	16.20 13	49.1 5	20.47 17	64.9 12
27.3	10.03 33	59.5 12	11.34 77	72.5 14	16.04 16	49.4 3	20.28 19	65.8 9
Oct. 7.3	9.68 35	60.1 6	10.53 81	73.3 8	15.88 16	49.5 1	20.07 21	66.2 4
17.2	9.32 36 34	60.2 1 4	9.71 82 81	73.7 4 3	15.71 17 15	49.4 1 3	19.87 20 20	66.3 1 4
27.2	8.98	59.8	8.90	73.4	15.56	49.1	19.67	65.9
Nov. 6.2	8.66 32	58.9 9	8.13 77	72.6 8	15.42 14	48.6 5	19.49 18	65.2 7
16.2	8.37 29	57.5 14	7.41 72	71.3 13	15.31 11	47.9 7	19.33 16	64.1 11
26.1	8.13 24	55.5 20	6.76 65	69.4 19	15.23 8	47.0 9	19.21 12	62.5 16
Dec. 6.1	7.94 19 14	53.2 23 28	6.21 55 43	67.1 23 27	15.19 4 1	46.0 10 12	19.12 9 5	60.7 18 21
16.1	7.80	50.4	5.78	64.4	15.18	44.8	19.07	58.6
26.0	7.73 7	47.4 30	5.47 31	61.3 31	15.22 4	43.6 12	19.07 0	56.3 23
36.0	7.73 0	44.1 33	5.30 17	58.0 33	15.29 7	42.3 13	19.11 4	53.8 25
Sec δ, Tan δ	1.670	+1.337	3.459	+3.312	1.001	+0.051	1.130	+0.527
Mean Place	8°.354	40'' .35	11°.809	52'' .90	12°.769	40'' .13	17°.588	49'' .51
D'α, Dα	-0.03	-0.03	-0.08	-0.07	0.00	0.00	-0.01	-0.01
Dδ, Dδ	+0.1	-0.9	+0.1	-0.9	+0.1	-0.9	+0.1	-0.9

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	ζ Cygni. Mag. 3.9		μ Aquilæ. Mag. 4.6		h Sagittarii. Mag. 4.7		κ Aquilæ. Mag. 5.0	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 19 27 s	° ' " + 51 32 "	h m 19 29 s	° ' " + 7 11 "	h m 19 31 s	° ' " - 25 4 "	h m 19 32 s	° ' " - 7 12 "
Jan. 1.0	31.72	50.8	55.42	45.8	31.45	28.4	18.46	69.2
11.0	31.74 <sup>2</sup>	47.6 <sup>32</sup>	55.51 <sup>9</sup>	44.2 <sup>16</sup>	31.56 <sup>11</sup>	28.0 <sup>4</sup>	18.56 <sup>10</sup>	69.9 <sup>7</sup>
21.0	31.83 <sup>9</sup>	44.3 <sup>33</sup>	55.64 <sup>13</sup>	42.7 <sup>15</sup>	31.71 <sup>15</sup>	27.6 <sup>4</sup>	18.69 <sup>13</sup>	70.6 <sup>7</sup>
31.0	31.98 <sup>15</sup>	41.1 <sup>32</sup>	55.80 <sup>16</sup>	41.3 <sup>14</sup>	31.90 <sup>19</sup>	27.1 <sup>5</sup>	18.86 <sup>17</sup>	71.2 <sup>6</sup>
Feb. 9.9	32.18 <sup>20</sup>	38.2 <sup>29</sup>	55.99 <sup>19</sup>	40.0 <sup>13</sup>	32.12 <sup>22</sup>	26.6 <sup>5</sup>	19.06 <sup>20</sup>	71.7 <sup>5</sup>
	26	27	21	11	25	6	22	4
19.9	32.44	35.5	56.20	38.9	32.37	26.0	19.28	72.1
Mar. 1.9	32.75 <sup>31</sup>	33.3 <sup>22</sup>	56.44 <sup>24</sup>	38.1 <sup>8</sup>	32.64 <sup>27</sup>	25.4 <sup>6</sup>	19.52 <sup>24</sup>	72.3 <sup>2</sup>
11.8	33.09 <sup>34</sup>	31.7 <sup>16</sup>	56.70 <sup>26</sup>	37.6 <sup>5</sup>	32.94 <sup>30</sup>	24.7 <sup>7</sup>	19.79 <sup>27</sup>	72.2 <sup>1</sup>
21.8	33.46 <sup>37</sup>	30.6 <sup>11</sup>	56.98 <sup>28</sup>	37.5 <sup>1</sup>	33.25 <sup>31</sup>	24.0 <sup>7</sup>	20.07 <sup>28</sup>	71.9 <sup>3</sup>
31.8	33.86 <sup>40</sup>	30.1 <sup>5</sup>	57.26 <sup>28</sup>	37.7 <sup>2</sup>	33.57 <sup>32</sup>	23.1 <sup>9</sup>	20.37 <sup>30</sup>	71.4 <sup>5</sup>
	41	2	30	6	34	9	30	8
Apr. 10.8	34.27	30.3	57.56	38.3	33.91	22.2	20.67	70.6
20.7	34.68 <sup>41</sup>	31.1 <sup>8</sup>	57.86 <sup>30</sup>	39.3 <sup>10</sup>	34.25 <sup>34</sup>	21.4 <sup>8</sup>	20.98 <sup>31</sup>	69.7 <sup>9</sup>
30.7	35.08 <sup>40</sup>	32.5 <sup>14</sup>	58.17 <sup>31</sup>	40.6 <sup>13</sup>	34.59 <sup>34</sup>	20.5 <sup>9</sup>	21.29 <sup>31</sup>	68.6 <sup>11</sup>
May 10.7	35.47 <sup>39</sup>	34.4 <sup>19</sup>	58.46 <sup>29</sup>	42.1 <sup>15</sup>	34.92 <sup>33</sup>	19.6 <sup>9</sup>	21.59 <sup>30</sup>	67.3 <sup>13</sup>
20.7	35.82 <sup>35</sup>	36.9 <sup>25</sup>	58.75 <sup>29</sup>	43.9 <sup>18</sup>	35.24 <sup>32</sup>	18.8 <sup>8</sup>	21.88 <sup>29</sup>	65.9 <sup>14</sup>
	32	28	27	19	31	7	28	14
30.6	36.14	39.7	59.02	45.8	35.55	18.1	22.16	64.5
June 9.6	36.42 <sup>28</sup>	42.8 <sup>31</sup>	59.26 <sup>24</sup>	47.8 <sup>20</sup>	35.83 <sup>28</sup>	17.5 <sup>6</sup>	22.41 <sup>25</sup>	63.1 <sup>14</sup>
19.6	36.64 <sup>22</sup>	46.1 <sup>33</sup>	59.47 <sup>21</sup>	49.8 <sup>20</sup>	36.08 <sup>25</sup>	17.1 <sup>4</sup>	22.64 <sup>23</sup>	61.7 <sup>14</sup>
29.5	36.81 <sup>17</sup>	49.6 <sup>35</sup>	59.65 <sup>18</sup>	51.8 <sup>20</sup>	36.30 <sup>22</sup>	16.8 <sup>3</sup>	22.84 <sup>20</sup>	60.4 <sup>13</sup>
July 9.5	36.91 <sup>10</sup>	53.1 <sup>35</sup>	59.79 <sup>14</sup>	53.8 <sup>20</sup>	36.47 <sup>17</sup>	16.6 <sup>2</sup>	22.99 <sup>15</sup>	59.2 <sup>13</sup>
	5	35	10	18	13	0	11	10
19.5	36.96	56.6	59.89	55.6	36.60	16.6	23.10	58.2
29.5	36.94 <sup>2</sup>	59.9 <sup>33</sup>	59.95 <sup>6</sup>	57.3 <sup>17</sup>	36.68 <sup>8</sup>	16.7 <sup>1</sup>	23.17 <sup>7</sup>	57.3 <sup>9</sup>
Aug. 8.4	36.85 <sup>9</sup>	63.0 <sup>31</sup>	59.96 <sup>1</sup>	58.9 <sup>16</sup>	36.71 <sup>3</sup>	17.0 <sup>3</sup>	23.20 <sup>3</sup>	56.5 <sup>8</sup>
18.4	36.71 <sup>14</sup>	65.9 <sup>29</sup>	59.93 <sup>3</sup>	60.2 <sup>13</sup>	36.69 <sup>2</sup>	17.3 <sup>3</sup>	23.18 <sup>2</sup>	55.9 <sup>6</sup>
28.4	36.51 <sup>20</sup>	68.4 <sup>25</sup>	59.86 <sup>7</sup>	61.3 <sup>11</sup>	36.63 <sup>6</sup>	17.7 <sup>4</sup>	23.12 <sup>6</sup>	55.4 <sup>5</sup>
	24	22	11	8	11	4	10	3
Sept. 7.4	36.27	70.6	59.75	62.1	36.52	18.1	23.02	55.1
17.3	35.98 <sup>29</sup>	72.3 <sup>17</sup>	59.62 <sup>13</sup>	62.8 <sup>7</sup>	36.39 <sup>13</sup>	18.5 <sup>4</sup>	22.89 <sup>13</sup>	54.9 <sup>2</sup>
27.3	35.67 <sup>31</sup>	73.6 <sup>13</sup>	59.47 <sup>15</sup>	63.2 <sup>4</sup>	36.23 <sup>16</sup>	18.9 <sup>4</sup>	22.75 <sup>14</sup>	54.9 <sup>0</sup>
Oct. 7.3	35.35 <sup>32</sup>	74.4 <sup>8</sup>	59.31 <sup>16</sup>	63.3 <sup>1</sup>	36.06 <sup>17</sup>	19.2 <sup>3</sup>	22.59 <sup>16</sup>	54.9 <sup>0</sup>
17.2	35.01 <sup>34</sup>	74.7 <sup>3</sup>	59.14 <sup>17</sup>	63.3 <sup>0</sup>	35.88 <sup>18</sup>	19.4 <sup>2</sup>	22.43 <sup>16</sup>	55.1 <sup>2</sup>
	32	3	16	3	17	1	15	2
27.2	34.69	74.4	58.98	63.0	35.71	19.5	22.28	55.3
Nov. 6.2	34.38 <sup>31</sup>	73.7 <sup>7</sup>	58.84 <sup>14</sup>	62.4 <sup>6</sup>	35.56 <sup>15</sup>	19.5 <sup>0</sup>	22.14 <sup>14</sup>	55.7 <sup>4</sup>
16.2	34.10 <sup>28</sup>	72.4 <sup>13</sup>	58.72 <sup>12</sup>	61.7 <sup>7</sup>	35.44 <sup>12</sup>	19.5 <sup>0</sup>	22.03 <sup>11</sup>	56.1 <sup>4</sup>
26.1	33.86 <sup>24</sup>	70.6 <sup>18</sup>	58.63 <sup>9</sup>	60.7 <sup>10</sup>	35.36 <sup>8</sup>	19.3 <sup>2</sup>	21.94 <sup>9</sup>	56.6 <sup>5</sup>
Dec. 6.1	33.66 <sup>20</sup>	68.4 <sup>22</sup>	58.57 <sup>6</sup>	59.5 <sup>12</sup>	35.31 <sup>5</sup>	19.0 <sup>3</sup>	21.90 <sup>4</sup>	57.1 <sup>5</sup>
	14	26	1	13	1	3	1	6
16.1	33.52	65.8	58.56	58.2	35.30	18.7	21.89	57.7
26.1	33.44 <sup>8</sup>	62.8 <sup>30</sup>	58.58 <sup>2</sup>	56.8 <sup>14</sup>	35.34 <sup>4</sup>	18.4 <sup>3</sup>	21.92 <sup>3</sup>	58.4 <sup>7</sup>
36.0	33.43 <sup>1</sup>	59.7 <sup>31</sup>	58.64 <sup>6</sup>	55.2 <sup>16</sup>	35.43 <sup>9</sup>	18.0 <sup>4</sup>	22.00 <sup>8</sup>	59.2 <sup>8</sup>
Sec δ, Tan δ	1.608	+1.259	1.008	+0.126	1.104	-0.468	1.008	-0.137
Mean Place	33°.800	53°'.71	56°.251	52°'.05	32°.153	19°'.74	19°.180	61°'.86
D'ψ α, Dω α	-0.03	-0.03	0.00	0.00	+0.01	+0.01	0.00	0.00
Dψ δ, Dω δ	+0.1	-0.9	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9

(Eph 15)

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\theta$ Cygni. Mag. 4.6		$\delta$ Sagittarii. Mag. 5.4		$\beta$ Sagittæ. Mag. 4.4		$\lambda$ Cygni. Mag. 5.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 19 34 s	° ' " + 50 1 "	h m 19 35 s	° ' " - 16 29 "	h m 19 37 s	° ' " + 17 16 "	h m 19 41 s	° ' " + 37 8 "
Jan. 1.0	7.75	23.2	50.60	28.6	12.91	37.2	11.30	51.9
11.0	7.77 2	20.0 32	50.70 10	28.7 1	12.98 7	35.1 21	11.34 4	49.1 28
21.0	7.85 8	16.8 32	50.84 14	28.8 1	13.09 11	33.1 20	11.43 9	46.2 29
31.0	7.99 14	13.6 32	51.02 18	28.8 0	13.23 14	31.2 19	11.56 13	43.4 28
Feb. 9.9	8.18 19	10.7 29	51.22 20	28.8 0	13.41 18	29.4 18	11.73 17	40.8 26
	25	27	23	2	21	16	21	23
19.9	8.43	8.0	51.45	28.6	13.62	27.8	11.94	38.5
Mar. 1.9	8.72 29	5.8 22	51.70 25	28.4 2	13.85 23	26.6 12	12.19 25	36.6 19
11.8	9.05 33	4.1 17	51.98 28	28.0 4	14.11 26	25.8 8	12.47 28	35.2 14
21.8	9.41 36	3.0 11	52.27 29	27.4 6	14.39 28	25.4 4	12.78 31	34.2 10
31.8	9.79 38	2.5 5	52.57 30	26.7 7	14.68 29	25.4 0	13.10 32	33.9 3
	40	2	32	9	30	5	34	2
Apr. 10.8	10.19	2.7	52.89	25.8	14.98	25.9	13.44	34.1
20.7	10.59 40	3.4 7	53.21 32	24.9 9	15.28 30	26.9 10	13.79 35	34.9 8
30.7	10.99 40	4.8 14	53.53 32	23.9 10	15.59 31	28.2 13	14.13 34	36.2 13
May 10.7	11.37 38	6.7 19	53.85 32	22.8 11	15.89 30	29.9 17	14.46 33	38.0 18
20.7	11.72 35	9.0 23	54.16 31	21.7 11	16.18 29	31.9 20	14.78 32	40.3 23
	32	28	29	11	27	22	29	26
30.6	12.04	11.8	54.45	20.6	16.45	34.1	15.07	42.9
June 9.6	12.32 28	14.9 31	54.72 27	19.6 10	16.70 25	36.4 23	15.33 26	45.8 29
19.6	12.55 23	18.2 33	54.96 24	18.7 9	16.91 21	38.9 25	15.56 23	48.8 30
29.5	12.73 18	21.6 34	55.17 21	17.9 8	17.09 18	41.4 25	15.74 18	52.0 32
July 9.5	12.84 11	25.1 35	55.33 16	17.2 7	17.23 14	43.9 25	15.87 13	55.2 32
	6	34	12	5	10	23	8	31
19.5	12.90	28.5	55.45	16.7	17.33	46.2	15.95	58.3
29.5	12.89 1	31.9 34	55.53 8	16.3 4	17.38 5	48.4 22	15.99 4	61.4 31
Aug. 8.4	12.82 7	35.0 31	55.57 4	16.0 3	17.39 1	50.5 21	15.97 2	64.2 28
18.4	12.70 12	37.9 29	55.55 2	15.9 1	17.36 3	52.3 18	15.90 7	66.8 26
28.4	12.52 18	40.5 26	55.49 6	15.9 0	17.28 8	53.8 15	15.78 12	69.1 23
	23	22	9	1	11	13	15	20
Sept. 7.4	12.29	42.7	55.40	16.0	17.17	55.1	15.63	71.1
17.3	12.03 26	44.5 18	55.28 12	16.1 1	17.03 14	56.1 10	15.44 19	72.7 16
27.3	11.74 29	45.8 13	55.13 15	16.3 2	16.86 17	56.8 7	15.22 22	73.8 11
Oct. 7.3	11.42 32	46.7 9	54.97 16	16.5 2	16.69 17	57.2 4	14.99 23	74.6 8
17.2	11.10 32	47.1 4	54.80 17	16.7 2	16.51 18	57.2 0	14.75 24	74.9 3
	31	2	16	2	17	2	23	2
27.2	10.79	46.9	54.64	16.9	16.34	57.0	14.52	74.7
Nov. 6.2	10.49 30	46.2 7	54.50 14	17.1 2	16.18 16	56.4 6	14.30 22	74.1 6
16.2	10.22 27	45.0 12	54.38 12	17.3 2	16.04 14	55.4 10	14.11 19	73.0 11
26.1	9.99 23	43.3 17	54.30 8	17.4 1	15.93 11	54.2 12	13.94 17	71.5 15
Dec. 6.1	9.80 19	41.2 21	54.25 5	17.6 2	15.86 7	52.8 14	13.82 12	69.6 19
	13	25	1	1	4	17	9	23
16.1	9.67	38.7	54.24	17.7	15.82	51.1	13.73	67.3
26.1	9.58 9	35.8 29	54.28 4	17.9 2	15.83 1	49.2 19	13.69 4	64.8 25
36.0	9.56 2	32.7 31	54.36 8	18.0 1	15.87 4	47.2 20	13.70 1	62.0 28
Sec $\delta$ , Tan $\delta$	1.556	+1.193	1.043	-0.296	1.047	+0.311	1.255	+0.758
Mean Place	9 <sup>h</sup> .746	25 <sup>m</sup> .54	51 <sup>h</sup> .289	20 <sup>m</sup> .51	13 <sup>h</sup> .855	42 <sup>m</sup> .23	12 <sup>h</sup> .705	54 <sup>m</sup> .78
$D\phi a$ , $D_{\phi} a$	-0.03	-0.03	+0.01	+0.01	-0.01	-0.01	-0.02	-0.02
$D\phi \delta$ , $D_{\phi} \delta$	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9

## FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date	$\beta$ Sagittarii. Mag. 5.1		$\gamma$ Aquilae. Mag. 2.8		$\delta$ Cygni. Mag. 3.0		$\delta$ Sagittae. Mag. 3.8	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 19 41	° ' " -19 57	h m 19 42	° ' " +10 24	h m 19 42	° ' " +44 54	h m 19 43	° ' " +18 19
Jan. 1.0	23.62	66.9	12.27	13.8	17.43	79.8	34.91	21.5
11.0	23.72	66.8	12.34	12.1	17.45	76.7	34.97	19.4
21.0	23.85	66.7	12.45	10.4	17.52	73.6	35.07	17.4
31.0	24.02	66.5	12.59	8.8	17.65	70.6	35.21	15.4
Feb. 9.9	24.23	66.2	12.77	7.4	17.83	67.8	35.38	13.5
19.9	24.46	65.8	12.97	6.2	18.06	65.2	35.59	11.9
Mar. 1.9	24.71	65.4	13.20	5.2	18.32	63.1	35.82	10.7
11.9	24.99	64.8	13.45	4.6	18.62	61.4	36.07	9.8
21.8	25.28	64.1	13.72	4.4	18.95	60.3	36.34	9.4
31.8	25.59	63.3	14.01	4.6	19.31	59.9	36.63	9.4
Apr. 10.8	25.91	62.4	14.31	5.2	19.67	60.0	36.93	9.9
20.7	26.23	61.4	14.61	6.1	20.05	60.7	37.24	10.8
30.7	26.56	60.4	14.91	7.4	20.42	62.0	37.55	12.1
May 10.7	26.89	59.4	15.21	9.0	20.78	63.8	37.85	13.8
20.7	27.20	58.4	15.50	10.8	21.12	66.1	38.14	15.8
30.6	27.50	57.4	15.78	12.8	21.43	68.1	38.42	17.8
June 9.6	27.78	56.5	16.03	15.0	21.71	71.8	38.67	19.5
19.6	28.03	55.8	16.25	17.2	21.94	75.0	38.89	21.2
29.6	28.25	55.1	16.44	19.4	22.13	78.3	39.08	22.9
July 9.5	28.42	54.6	16.59	21.5	22.26	81.7	39.22	24.6
19.5	28.55	54.3	16.69	23.6	22.33	85.0	39.33	26.3
29.5	28.64	54.1	16.76	25.5	22.35	88.3	39.39	28.0
Aug. 8.4	28.68	54.0	16.78	27.2	22.31	91.4	39.40	29.7
18.4	28.67	54.1	16.76	28.7	22.22	94.2	39.37	31.4
28.4	28.62	54.2	16.69	30.0	22.08	96.7	39.30	33.1
Sept. 7.4	28.53	54.4	16.59	31.1	21.89	98.9	39.19	34.8
17.3	28.40	54.7	16.46	31.9	21.66	100.7	39.05	36.5
27.3	28.25	55.0	16.31	32.4	21.41	102.0	38.89	38.2
Oct. 7.3	28.09	55.3	16.15	32.7	21.14	102.9	38.71	39.9
17.3	27.92	55.5	15.98	32.7	20.86	103.3	38.53	41.6
27.2	27.76	55.7	15.81	32.4	20.59	103.2	38.35	43.3
Nov. 6.2	27.61	55.9	15.66	31.9	20.33	102.6	38.19	45.0
16.2	27.49	56.0	15.54	31.1	20.09	101.5	38.05	46.7
26.1	27.40	56.0	15.44	30.1	19.89	99.9	37.94	48.4
Dec. 6.1	27.35	56.0	15.37	28.9	19.72	97.9	37.86	50.1
16.1	27.33	56.0	15.34	27.5	19.61	95.5	37.82	51.8
26.1	27.36	55.9	15.35	25.9	19.54	92.8	37.82	53.5
36.0	27.44	55.9	15.40	24.3	19.53	89.9	37.85	55.2
Sec $\delta$ , Tan $\delta$	1.064	-0.363	1.017	+0.184	1.412	+0.997	1.053	+0.331
Mean Place	24°.292	58''.56	13° 113	19''.19	19°.145	81''.83	35°.865	16''.06
$D\alpha$ , $D_\alpha$	+0.01	+0.01	0.00	-0.01	-0.02	-0.03	-0.01	-0.01
$D\delta$ , $D_\delta$	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9



FOR THE UPPER TRANSIT AT WASHINGTON.

Solar date.	$\alpha$ Aquilæ. (Altair.) Mag. 0.9		$\eta$ Aquilæ. Var. 3.7-4.4		$\epsilon$ Draconis. Mag. 4.0		$\iota$ Sagittarii. Mag. 4.2	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 19 46 s	° ' " + 8 38 "	h m 19 48 s	° ' " + 0 47 "	h m 19 48 s	° ' " + 70 2 "	h m 19 49 s	° ' " - 42 5 "
a. 1.0	37.35	29.4	7.86	5.9	23.67	65.5	23.14	43.3
11.0	37.42 7	27.8 16	7.94 8	4.8 11	23.54 13	62.3 32	23.25 11	41.8 15
21.0	37.53 11	26.3 15	8.05 11	3.6 12	23.53 1	58.9 34	23.40 15	40.3 15
31.0	37.67 14	24.8 15	8.20 15	2.6 10	23.64 11	55.5 34	23.60 20	38.8 15
b. 9.9	37.85 18 20	23.5 13 11	8.37 17 20	1.7 9 7	23.87 23 33	52.3 32 30	23.84 24 27	37.2 16 16
19.9	38.05	22.4	8.57	1.0	24.20	49.3	24.11	35.6
ur. 1.9	38.27 22	21.5 9	8.80 23	0.5 5	24.64 44	46.7 26	24.42 31	34.1 15
11.9	38.52 25	21.0 5	9.05 25	0.3 2	25.16 52	44.6 21	24.76 34	32.7 14
21.8	38.79 27	20.9 1	9.32 27	0.4 1	25.75 59	43.1 15	25.12 36	31.3 14
31.8	39.08 29 29	21.1 2 6	9.60 28 30	0.8 4 7	26.39 64 67	42.2 9 3	25.50 38 39	30.1 12 12
ur. 10.8	39.37	21.7	9.90	1.5	27.06	41.9	25.89	28.9
20.7	39.67 30	22.6 9	10.20 30	2.4 9	27.74 68	42.3 4	26.29 40	27.9 10
30.7	39.98 31	23.9 13	10.51 31	3.7 13	28.41 67	43.4 11	26.70 41	27.1 8
ay 10.7	40.29 31	25.5 16	10.81 30	5.2 15	29.05 64	45.0 16	27.10 40	26.5 6
20.7	40.58 29 27	27.3 18 20	11.10 29 28	6.8 16 17	29.64 59 52	47.1 21 26	27.49 39 38	26.1 4 2
30.6	40.85	29.3	11.38	8.5	30.16	49.7	27.87	25.9
ne 9.6	41.11 26	31.4 21	11.64 26	10.3 18	30.60 44	52.7 30	28.21 34	25.9 0
19.6	41.34 23	33.5 21	11.87 23	12.1 18	30.95 35	56.0 33	28.53 32	26.2 3
29.6	41.53 19	35.7 22	12.07 20	13.8 17	31.19 24	59.5 35	28.80 27	26.7 5
ly 9.5	41.69 16 11	37.7 20 20	12.24 17 12	15.5 17 16	31.33 14 3	63.2 37 36	29.02 22 17	27.5 8 9
19.5	41.80	39.7	12.36	17.1	31.36	66.8	29.19	28.4
29.5	41.87 7	41.6 19	12.44 8	18.5 14	31.28 8	70.4 36	29.30 11	29.5 11
ig. 8.4	41.90 3	43.2 16	12.47 3	19.7 12	31.09 19	73.9 35	29.35 5	30.6 11
18.4	41.88 2	44.7 15	12.46 1	20.8 11	30.79 30	77.1 32	29.34 1	31.8 12
28.4	41.82 6 9	45.9 12 10	12.41 5 9	21.7 9 6	30.40 39 47	80.1 30 26	29.27 7 11	33.0 12 12
pt. 7.4	41.73	46.9	12.32	22.3	29.93	82.7	29.16	34.2
17.3	41.60 13	47.7 8	12.20 12	22.8 5	29.39 54	85.0 23	29.00 16	35.2 10
27.3	41.46 14	48.2 5	12.06 14	23.1 3	28.79 60	86.7 17	28.81 19	36.0 8
t. 7.3	41.30 16	48.5 3	11.90 16	23.2 1	28.15 64	88.0 13	28.60 21	36.7 7
17.3	41.13 17 16	48.5 0' 2	11.74 16 15	23.1 1 3	27.49 66 67	88.8 8 2	28.38 22 22	37.1 4 1
27.2	40.97	48.3	11.59	22.8	26.82	89.0	28.16	37.2
iv. 6.2	40.83 14	47.8 5	11.45 14	22.4 4	26.17 65	88.7 3	27.96 20	37.0 2
16.2	40.70 13	47.1 7	11.33 12	21.8 6	25.55 62	87.8 9	27.79 17	36.5 5
26.1	40.60 10	46.1 10	11.23 10	21.1 7	24.99 56	86.4 14	27.66 13	35.8 7
c. 6.1	40.53 7 3	45.0 11 13	11.17 6 2	20.3 8 10	24.50 49 42	84.4 20 24	27.57 9 3	34.9 9 12
16.1	40.50	43.7	11.15	19.3	24.08	82.0	27.54	33.7
26.1	40.51 1	42.2 15	11.16 1	18.2 11	23.77 31	79.1 29	27.55 1	32.4 13
36.0	40.56 5	40.7 15	11.21 5	17.1 11	23.57 20	76.0 31	27.62 7	31.0 14
tan $\delta$	1.011	+0.152	1.000	+0.014	2.931	+2.755	1.348	-0.903
Place	38°.170	34''.84	8°.606	12''.13	28°.126	65''.07	23°.926	33''.21
$D_{\alpha}$	0.00	0.00	0.00	0.00	-0.07	-0.08	+0.02	+0.03
$D_{\delta}$	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9	+0.2	-0.9





FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	$\tau$ Aquilæ. Mag. 5.6		$\theta$ Aquilæ. Mag. 3.4		$\omicron$ Cygni seq. Mag. 4.0		$\kappa$ Cephei. Mag. 4.4	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 19 59 s 19 59 10 13 16 19	° ' " + 7 2 " 10.2 8.7 15 7.3 14 5.9 14 4.7 12 10	h m 20 6 s 20 6 6 9 13 16 19	° ' " - 1. 4 " 33.5 34.5 10 35.4 9 36.3 9 37.0 7 6	h m 20 10 s 20 10 2 4 9 14 19	° ' " + 46 28 " 59.7 56.7 30 53.7 30 50.7 30 47.8 29 27	h m 20 11 s 20 11 37 18 0 20 38	° ' " + 77 26 " 84.8 81.7 31 78.4 33 75.1 33 71.8 33 30
n. 1.1	58.50	10.2	54.49	33.5	55.60	59.7	39.16	84.8
11.0	58.55 5	8.7 15	54.55 6	34.5 10	55.58 2	56.7 30	38.79 37	81.7 31
21.0	58.65 10	7.3 14	54.64 9	35.4 9	55.62 4	53.7 30	38.61 18	78.4 33
31.0	58.78 13	5.9 14	54.77 13	36.3 9	55.71 9	50.7 30	38.61 0	75.1 33
b. 10.0	58.94 16	4.7 12	54.93 16	37.0 7	55.85 14	47.8 29	38.81 20	71.8 33
	19	10	19	6	19	27	38	30
19.9	59.13	3.7 8	55.12	37.6	56.04	45.1	39.19	68.8
ar. 1.9	59.34 21	2.9 8	55.33 21	38.0 4	56.28 24	42.8 23	39.75 56	66.0 28
11.9	59.58 24	2.4 5	55.57 24	38.1 1	56.56 28	40.9 19	40.45 70	63.6 24
21.8	59.84 26	2.3 1	55.83 26	37.9 2	56.87 31	39.5 14	41.28 83	61.8 18
31.8	60.12 28	2.6 3	56.10 27	37.4 5	57.22 35	38.8 7	42.21 93	60.5 13
	30	6	30	8	37	2	99	6
pr. 10.8	60.42	3.2 10	56.40	36.6	57.59	38.6	43.20 102	59.9 0
20.8	60.72 30	4.2 12	56.70 30	35.6 12	57.97 38	39.0 4	44.22 102	59.9 7
30.7	61.02 30	5.4 16	57.00 30	34.4 15	58.35 38	40.1 16	45.24 99	60.6 12
ay 10.7	61.33 31	7.0 17	57.31 31	32.9 16	58.73 37	41.7 20	46.23 91	61.8 18
20.7	61.62 29	8.7 20	57.62 29	31.3 17	59.10 34	43.7 25	47.14 82	63.6 23
	29							
30.7	61.91	10.7 20	57.91	29.6 18	59.44	46.2 29	47.96 70	65.9 28
me 9.6	62.17 26	12.7 21	58.18 27	27.8 18	59.75 31	49.1 31	48.66 56	68.7 31
19.6	62.41 24	14.8 21	58.43 25	26.0 17	60.02 27	52.2 34	49.22 42	71.8 34
29.6	62.61 20	16.9 20	58.64 21	24.3 16	60.24 17	55.6 34	49.64 24	75.2 35
ily 9.5	62.78 13	18.9 19	58.82 14	22.7 15	60.41 11	59.0 34	49.88 8	78.7 36
19.5	62.91 8	20.8 18	58.96 10	21.2 14	60.52 6	62.4 34	49.96 9	82.3 37
29.5	62.99 4	22.6 16	59.06 5	19.8 12	60.58 0	65.8 33	49.87 25	86.0 36
ig. 8.5	63.03 0	24.2 14	59.11 1	18.6 10	60.58 7	69.1 30	49.62 42	89.6 34
18.4	63.03 5	25.6 12	59.12 4	17.6 8	60.51 11	72.1 28	49.20 56	93.0 32
28.4	62.98 8	26.8 10	59.08 7	16.8 6	60.40 17	74.9 25	48.64 71	96.2 29
pt. 7.4	62.90 12	27.8 7	59.01 11	16.2 4	60.23 20	77.4 21	47.93 82	99.1 26
17.4	62.78 14	28.5 5	58.90 13	15.8 3	60.03 24	79.5 17	47.11 92	101.7 22
27.3	62.64 15	29.0 3	58.77 15	15.5 1	59.79 26	81.2 12	46.19 99	103.9 17
st. 7.3	62.49 16	29.3 0	58.62 15	15.4 1	59.53 28	82.4 8	45.20 105	105.6 12
17.3	62.33 16	29.3 2	58.47 16	15.5 2	59.25 28	83.2 3	44.15 108	106.8 7
27.2	62.17 15	29.1 4	58.31 14	15.7 4	58.97 27	83.5 3	43.07 107	107.5 1
iv. 6.2	62.02 13	28.7 6	58.17 13	16.1 5	58.70 25	83.2 7	42.00 104	107.6 4
16.2	61.89 10	28.1 9	58.04 10	16.6 6	58.45 23	82.5 13	40.96 98	107.2 10
26.2	61.79 8	27.2 10	57.94 7	17.2 8	58.22 19	81.2 17	39.98 90	106.2 15
xc. 6.1	61.71 4	26.2 12	57.87 4	18.0 8	58.03 15	79.5 22	39.08 78	104.7 21
16.1	61.67 0	25.0 14	57.83 0	18.8 10	57.88 11	77.3 25	38.30 63	102.6 25
26.1	61.67 4	23.6 14	57.83 4	19.8 9	57.77 5	74.8 28	37.67 48	100.1 29
36.1	61.71	22.2 14	57.87	20.7	57.72	72.0	37.19	97.2
$\delta$ , Tan $\delta$	1.008	+0.123	1.000	-0.019	1.452	+1.053	4.605	+4.495
n Place	59°.274	15''.26	55°.179	27''.58	57°.352	59''.01	46°.465	81''.33
$\alpha$ , D $_{\alpha}$ $\alpha$	0.00	0.00	0.00	0.00	-0.02	-0.04	-0.10	-0.16
$\beta$ , D $_{\alpha}$ $\delta$	+0.2	-0.9	+0.2	-0.9	+0.2	-0.8	+0.2	-0.8



FOR THE UPPER TRANSIT AT WASHINGTON.

n Solar date.	γ Cygni. Mag. 2.3		π Capricorni. Mag. 5.2		ρ Capricorni. Mag. 5.0		41 Cygni. Mag. 4.1	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 20 19 s	° ' " + 39 58 "	h m 20 22 s	° ' " − 18 29 "	h m 20 24 s	° ' " − 18 5 "	h m 20 25 s	° ' " + 30 4 "
n. I.1	9.20	63.1	26.88	35.7	0.28	51.5	54.27	63.3
II.0	9.19 <sup>1</sup>	60.4 <sup>27</sup>	26.93 <sup>5</sup>	35.6 <sup>1</sup>	0.33 <sup>5</sup>	51.5 <sup>0</sup>	54.28 <sup>1</sup>	61.0 <sup>23</sup>
21.0	9.22 <sup>3</sup>	57.6 <sup>28</sup>	27.02 <sup>9</sup>	35.5 <sup>1</sup>	0.42 <sup>9</sup>	51.4 <sup>1</sup>	54.32 <sup>4</sup>	58.5 <sup>25</sup>
31.0	9.31 <sup>9</sup>	54.8 <sup>28</sup>	27.15 <sup>13</sup>	35.2 <sup>3</sup>	0.55 <sup>13</sup>	51.1 <sup>3</sup>	54.41 <sup>9</sup>	56.1 <sup>24</sup>
b. 10.0	9.44 <sup>13</sup>	52.1 <sup>27</sup>	27.31 <sup>16</sup>	34.8 <sup>4</sup>	0.71 <sup>16</sup>	50.8 <sup>3</sup>	54.53 <sup>12</sup>	53.7 <sup>24</sup>
	<sup>17</sup>	<sup>25</sup>	<sup>19</sup>	<sup>4</sup>	<sup>18</sup>	<sup>5</sup>	<sup>17</sup>	<sup>21</sup>
19.9	9.61	49.6	27.50	34.4	0.89	50.3	54.70	51.6
tr. I.9	9.83 <sup>22</sup>	47.4 <sup>22</sup>	27.71 <sup>21</sup>	33.8 <sup>6</sup>	1.11 <sup>22</sup>	49.7 <sup>6</sup>	54.90 <sup>20</sup>	49.8 <sup>18</sup>
II.9	10.08 <sup>25</sup>	45.7 <sup>17</sup>	27.96 <sup>25</sup>	33.0 <sup>8</sup>	1.35 <sup>24</sup>	49.0 <sup>7</sup>	55.13 <sup>23</sup>	48.4 <sup>14</sup>
21.9	10.37 <sup>29</sup>	44.5 <sup>12</sup>	28.22 <sup>26</sup>	32.2 <sup>8</sup>	1.61 <sup>26</sup>	48.1 <sup>9</sup>	55.39 <sup>26</sup>	47.4 <sup>10</sup>
31.8	10.68 <sup>31</sup>	43.8 <sup>7</sup>	28.51 <sup>29</sup>	31.1 <sup>11</sup>	1.89 <sup>28</sup>	47.1 <sup>10</sup>	55.67 <sup>28</sup>	46.9 <sup>5</sup>
	<sup>34</sup>	<sup>1</sup>	<sup>30</sup>	<sup>11</sup>	<sup>31</sup>	<sup>11</sup>	<sup>31</sup>	<sup>1</sup>
tr. 10.8	11.02	43.7	28.81	30.0	2.20	46.0	55.98	47.0
20.8	11.37 <sup>35</sup>	44.1 <sup>4</sup>	29.13 <sup>32</sup>	28.8 <sup>12</sup>	2.51 <sup>31</sup>	44.8 <sup>12</sup>	56.30 <sup>32</sup>	47.6 <sup>6</sup>
30.7	11.73 <sup>36</sup>	45.1 <sup>10</sup>	29.45 <sup>32</sup>	27.5 <sup>13</sup>	2.84 <sup>33</sup>	43.5 <sup>13</sup>	56.63 <sup>33</sup>	48.7 <sup>11</sup>
ay 10.7	12.09 <sup>36</sup>	46.7 <sup>16</sup>	29.78 <sup>33</sup>	26.1 <sup>14</sup>	3.17 <sup>33</sup>	42.1 <sup>14</sup>	56.96 <sup>33</sup>	50.2 <sup>15</sup>
20.7	12.43 <sup>34</sup>	48.7 <sup>20</sup>	30.11 <sup>33</sup>	24.8 <sup>13</sup>	3.49 <sup>32</sup>	40.8 <sup>13</sup>	57.29 <sup>33</sup>	52.2 <sup>20</sup>
	<sup>33</sup>	<sup>24</sup>	<sup>32</sup>	<sup>12</sup>	<sup>32</sup>	<sup>13</sup>	<sup>31</sup>	<sup>23</sup>
30.7	12.76	51.1	30.43	23.6	3.81	39.5	57.60	54.5
ne 9.6	13.06 <sup>30</sup>	53.9 <sup>28</sup>	30.73 <sup>30</sup>	22.4 <sup>12</sup>	4.11 <sup>30</sup>	38.3 <sup>12</sup>	57.89 <sup>29</sup>	57.1 <sup>26</sup>
19.6	13.33 <sup>27</sup>	56.9 <sup>30</sup>	31.00 <sup>27</sup>	21.3 <sup>11</sup>	4.39 <sup>28</sup>	37.2 <sup>11</sup>	58.15 <sup>26</sup>	59.9 <sup>28</sup>
29.6	13.55 <sup>22</sup>	60.1 <sup>32</sup>	31.25 <sup>25</sup>	20.4 <sup>9</sup>	4.63 <sup>24</sup>	36.2 <sup>10</sup>	58.37 <sup>22</sup>	62.8 <sup>29</sup>
ly 9.6	13.73 <sup>18</sup>	63.4 <sup>33</sup>	31.46 <sup>21</sup>	19.7 <sup>7</sup>	4.84 <sup>21</sup>	35.5 <sup>7</sup>	58.56 <sup>19</sup>	65.8 <sup>30</sup>
	<sup>13</sup>	<sup>33</sup>	<sup>17</sup>	<sup>6</sup>	<sup>17</sup>	<sup>6</sup>	<sup>14</sup>	<sup>30</sup>
19.5	13.86	66.7	31.63	19.1	5.01	34.9	58.70	68.8
29.5	13.93 <sup>7</sup>	69.9 <sup>32</sup>	31.75 <sup>12</sup>	18.7 <sup>4</sup>	5.14 <sup>13</sup>	34.5 <sup>4</sup>	58.79 <sup>9</sup>	71.7 <sup>29</sup>
ig. 8.5	13.95 <sup>2</sup>	73.0 <sup>31</sup>	31.83 <sup>8</sup>	18.5 <sup>2</sup>	5.21 <sup>7</sup>	34.2 <sup>3</sup>	58.83 <sup>4</sup>	74.5 <sup>28</sup>
18.4	13.92 <sup>3</sup>	75.9 <sup>29</sup>	31.86 <sup>3</sup>	18.5 <sup>0</sup>	5.25 <sup>4</sup>	34.1 <sup>1</sup>	58.83 <sup>0</sup>	77.1 <sup>26</sup>
28.4	13.84 <sup>8</sup>	78.6 <sup>27</sup>	31.84 <sup>2</sup>	18.6 <sup>1</sup>	5.23 <sup>2</sup>	34.2 <sup>1</sup>	58.77 <sup>6</sup>	79.4 <sup>23</sup>
	<sup>13</sup>	<sup>23</sup>	<sup>6</sup>	<sup>2</sup>	<sup>6</sup>	<sup>2</sup>	<sup>9</sup>	<sup>21</sup>
pt. 7.4	13.71	80.9	31.78	18.8	5.17	34.4	58.68	81.5
17.4	13.54 <sup>17</sup>	82.9 <sup>20</sup>	31.68 <sup>10</sup>	19.1 <sup>3</sup>	5.07 <sup>10</sup>	34.7 <sup>3</sup>	58.55 <sup>13</sup>	83.2 <sup>17</sup>
27.3	13.34 <sup>20</sup>	84.5 <sup>16</sup>	31.56 <sup>12</sup>	19.4 <sup>3</sup>	4.95 <sup>12</sup>	35.0 <sup>3</sup>	58.39 <sup>16</sup>	84.6 <sup>14</sup>
t. 7.3	13.12 <sup>22</sup>	85.7 <sup>12</sup>	31.41 <sup>15</sup>	19.8 <sup>4</sup>	4.81 <sup>14</sup>	35.4 <sup>4</sup>	58.21 <sup>18</sup>	85.6 <sup>10</sup>
17.3	12.89 <sup>23</sup>	86.5 <sup>8</sup>	31.26 <sup>15</sup>	20.2 <sup>4</sup>	4.65 <sup>16</sup>	35.8 <sup>4</sup>	58.01 <sup>20</sup>	86.2 <sup>6</sup>
	<sup>24</sup>	<sup>2</sup>	<sup>16</sup>	<sup>3</sup>	<sup>16</sup>	<sup>3</sup>	<sup>20</sup>	<sup>2</sup>
27.3	12.65	86.7	31.10	20.5	4.49	36.1	57.81	86.4
iv. 6.2	12.41 <sup>24</sup>	86.5 <sup>2</sup>	30.95 <sup>15</sup>	20.8 <sup>3</sup>	4.34 <sup>15</sup>	36.4 <sup>3</sup>	57.62 <sup>19</sup>	86.1 <sup>3</sup>
16.2	12.20 <sup>21</sup>	85.8 <sup>7</sup>	30.81 <sup>14</sup>	21.0 <sup>2</sup>	4.21 <sup>13</sup>	36.7 <sup>3</sup>	57.44 <sup>18</sup>	85.5 <sup>6</sup>
26.2	12.00 <sup>20</sup>	84.7 <sup>11</sup>	30.71 <sup>10</sup>	21.2 <sup>2</sup>	4.10 <sup>11</sup>	36.9 <sup>2</sup>	57.29 <sup>15</sup>	84.5 <sup>10</sup>
c. 6.1	11.84 <sup>16</sup>	83.1 <sup>16</sup>	30.63 <sup>8</sup>	21.4 <sup>2</sup>	4.02 <sup>8</sup>	37.1 <sup>2</sup>	57.16 <sup>13</sup>	83.1 <sup>14</sup>
	<sup>13</sup>	<sup>20</sup>	<sup>5</sup>	<sup>1</sup>	<sup>5</sup>	<sup>1</sup>	<sup>10</sup>	<sup>18</sup>
16.1	11.71	81.1	30.58	21.5	3.97	37.2	57.06	81.3
26.1	11.63 <sup>8</sup>	78.8 <sup>23</sup>	30.57 <sup>1</sup>	21.5 <sup>0</sup>	3.96 <sup>1</sup>	37.2 <sup>0</sup>	57.00 <sup>6</sup>	79.3 <sup>20</sup>
36.1	11.59 <sup>4</sup>	76.2 <sup>26</sup>	30.60 <sup>3</sup>	21.4 <sup>1</sup>	3.99 <sup>3</sup>	37.2 <sup>0</sup>	56.98 <sup>2</sup>	77.0 <sup>23</sup>
l, Tan δ	1.305	+0.839	1.054	−0.334	1.052	−0.327	1.156	+0.579
l Place	10°.642	62''.59	27°.442	27''.63	0°.841	43''.55	55°.395	63''.65
l, D <sub>α</sub> α	−0.02	−0.03	+0.01	+0.01	+0.01	+0.01	−0.01	−0.01
l, D <sub>α</sub> δ	+0.2	−0.8	+0.2	−0.8	+0.2	−0.8	+0.2	−0.8



FOR THE UPPER TRANSIT AT WASHINGTON.

m Solar Date.	$\beta$ Delphini. Mag. 3.7		$\nu$ Capricorni. Mag. 5.3		$\alpha$ Delphini. Mag. 3.9		$\beta$ Pavonis. Mag. 3.6	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 20 33 s	° ' + 14 17 "	h m 20 35 s	° ' — 18 26 "	h m 20 35 s	° ' + 15 36 "	h m 20 37 s	° ' — 66 30 "
n. 1.1	33.03	53.2	12.24	26.5	40.61	40.3	17.54	48.6
11.1	33.05 <sup>2</sup>	51.5 <sup>17</sup>	12.29 <sup>5</sup>	26.4 <sup>1</sup>	40.62 <sup>1</sup>	38.5 <sup>18</sup>	17.54 <sup>0</sup>	45.8 <sup>28</sup>
21.0	33.11 <sup>6</sup>	49.8 <sup>17</sup>	12.37 <sup>8</sup>	26.3 <sup>1</sup>	40.67 <sup>5</sup>	36.8 <sup>17</sup>	17.63 <sup>9</sup>	42.9 <sup>29</sup>
31.0	33.20 <sup>9</sup>	48.1 <sup>17</sup>	12.48 <sup>11</sup>	26.0 <sup>3</sup>	40.76 <sup>9</sup>	35.0 <sup>18</sup>	17.81 <sup>18</sup>	40.0 <sup>29</sup>
b. 10.0	33.32 <sup>12</sup>	46.5 <sup>16</sup>	12.63 <sup>15</sup>	25.6 <sup>4</sup>	40.88 <sup>12</sup>	33.4 <sup>16</sup>	18.08 <sup>27</sup>	37.0 <sup>30</sup>
	16	13	17	5	16	14	35	30
19.9	33.48	45.2	12.80	25.1	41.04	32.0	18.43	34.0
ar. 1.9	33.67 <sup>19</sup>	44.1 <sup>11</sup>	13.00 <sup>20</sup>	24.4 <sup>7</sup>	41.22 <sup>18</sup>	30.8 <sup>12</sup>	18.85 <sup>42</sup>	31.1 <sup>29</sup>
11.9	33.88 <sup>21</sup>	43.3 <sup>8</sup>	13.23 <sup>23</sup>	23.6 <sup>8</sup>	41.43 <sup>21</sup>	30.0 <sup>8</sup>	19.34 <sup>49</sup>	28.4 <sup>27</sup>
21.9	34.12 <sup>24</sup>	42.9 <sup>4</sup>	13.49 <sup>26</sup>	22.7 <sup>9</sup>	41.67 <sup>24</sup>	29.5 <sup>5</sup>	19.89 <sup>55</sup>	26.0 <sup>24</sup>
31.8	34.39 <sup>27</sup>	42.9 <sup>0</sup>	13.77 <sup>28</sup>	21.6 <sup>11</sup>	41.94 <sup>27</sup>	29.5 <sup>0</sup>	20.49 <sup>60</sup>	23.8 <sup>22</sup>
	28	4	30	12	28	3	63	19
pr. 10.8	34.67	43.3	14.07	20.4	42.22	29.8	21.12	21.9
20.8	34.97 <sup>30</sup>	44.1 <sup>8</sup>	14.38 <sup>31</sup>	19.1 <sup>13</sup>	42.52 <sup>30</sup>	30.6 <sup>8</sup>	21.79 <sup>67</sup>	20.4 <sup>15</sup>
30.8	35.28 <sup>31</sup>	45.3 <sup>12</sup>	14.70 <sup>32</sup>	17.7 <sup>14</sup>	42.83 <sup>31</sup>	31.8 <sup>12</sup>	22.47 <sup>68</sup>	19.2 <sup>12</sup>
ay 10.7	35.59 <sup>31</sup>	46.8 <sup>15</sup>	15.03 <sup>33</sup>	16.3 <sup>14</sup>	43.14 <sup>31</sup>	33.3 <sup>15</sup>	23.16 <sup>69</sup>	18.4 <sup>8</sup>
20.7	35.90 <sup>31</sup>	48.7 <sup>19</sup>	15.36 <sup>33</sup>	14.9 <sup>14</sup>	43.46 <sup>32</sup>	35.2 <sup>19</sup>	23.85 <sup>69</sup>	18.0 <sup>4</sup>
	30	21	32	13	30	21	66	1
30.7	36.20	50.8	15.68	13.6	43.76	37.3	24.51	18.1
me 9.6	36.48 <sup>28</sup>	53.0 <sup>22</sup>	15.99 <sup>31</sup>	12.3 <sup>13</sup>	44.04 <sup>28</sup>	39.6 <sup>23</sup>	25.13 <sup>62</sup>	18.6 <sup>5</sup>
19.6	36.74 <sup>26</sup>	55.4 <sup>24</sup>	16.28 <sup>29</sup>	11.2 <sup>11</sup>	44.30 <sup>26</sup>	42.0 <sup>24</sup>	25.70 <sup>57</sup>	19.5 <sup>9</sup>
29.6	36.97 <sup>23</sup>	57.8 <sup>24</sup>	16.53 <sup>25</sup>	10.2 <sup>10</sup>	44.53 <sup>23</sup>	44.5 <sup>25</sup>	26.21 <sup>51</sup>	20.7 <sup>12</sup>
ly 9.6	37.17 <sup>20</sup>	60.2 <sup>24</sup>	16.75 <sup>22</sup>	9.4 <sup>8</sup>	44.73 <sup>20</sup>	46.9 <sup>24</sup>	26.65 <sup>44</sup>	22.3 <sup>16</sup>
	15	24	18	6	16	25	34	19
19.5	37.32	62.6	16.93	8.8	44.89	49.4	26.99	24.2
29.5	37.43 <sup>11</sup>	64.8 <sup>22</sup>	17.07 <sup>14</sup>	8.3 <sup>5</sup>	45.00 <sup>11</sup>	51.7 <sup>23</sup>	27.23 <sup>24</sup>	26.3 <sup>21</sup>
ig. 8.5	37.50 <sup>7</sup>	66.9 <sup>21</sup>	17.15 <sup>8</sup>	8.1 <sup>2</sup>	45.06 <sup>6</sup>	53.8 <sup>21</sup>	27.37 <sup>14</sup>	28.6 <sup>23</sup>
18.5	37.52 <sup>2</sup>	68.8 <sup>19</sup>	17.19 <sup>4</sup>	8.0 <sup>1</sup>	45.08 <sup>2</sup>	55.8 <sup>20</sup>	27.41 <sup>4</sup>	30.9 <sup>23</sup>
28.4	37.50 <sup>2</sup>	70.5 <sup>17</sup>	17.19 <sup>0</sup>	8.1 <sup>1</sup>	45.06 <sup>2</sup>	57.5 <sup>17</sup>	27.34 <sup>7</sup>	33.3 <sup>24</sup>
	7	14	5	2	6	15	17	22
pt. 7.4	37.43	71.9	17.14	8.3	45.00	59.0	27.17	35.5
17.4	37.34 <sup>9</sup>	73.0 <sup>11</sup>	17.05 <sup>9</sup>	8.6 <sup>3</sup>	44.90 <sup>10</sup>	60.2 <sup>12</sup>	26.91 <sup>26</sup>	37.5 <sup>20</sup>
27.3	37.21 <sup>13</sup>	73.9 <sup>9</sup>	16.94 <sup>11</sup>	9.0 <sup>4</sup>	44.78 <sup>12</sup>	61.1 <sup>9</sup>	26.58 <sup>33</sup>	39.3 <sup>18</sup>
t. 7.3	37.06 <sup>15</sup>	74.5 <sup>6</sup>	16.80 <sup>14</sup>	9.4 <sup>4</sup>	44.63 <sup>15</sup>	61.8 <sup>7</sup>	26.18 <sup>40</sup>	40.7 <sup>14</sup>
17.3	36.90 <sup>16</sup>	74.8 <sup>3</sup>	16.64 <sup>16</sup>	9.9 <sup>5</sup>	44.47 <sup>16</sup>	62.1 <sup>3</sup>	25.75 <sup>43</sup>	41.6 <sup>9</sup>
	16	0	15	4	16	0	46	5
27.3	36.74	74.8	16.49	10.3	44.31	62.1	25.29	42.1
iv. 6.2	36.59 <sup>15</sup>	74.5 <sup>3</sup>	16.34 <sup>15</sup>	10.6 <sup>3</sup>	44.15 <sup>16</sup>	61.9 <sup>2</sup>	24.84 <sup>45</sup>	42.1 <sup>0</sup>
16.2	36.44 <sup>15</sup>	73.9 <sup>6</sup>	16.20 <sup>14</sup>	10.9 <sup>3</sup>	44.00 <sup>15</sup>	61.3 <sup>6</sup>	24.42 <sup>42</sup>	41.6 <sup>5</sup>
26.2	36.32 <sup>12</sup>	73.1 <sup>8</sup>	16.09 <sup>11</sup>	11.1 <sup>2</sup>	43.88 <sup>12</sup>	60.5 <sup>8</sup>	24.04 <sup>38</sup>	40.5 <sup>11</sup>
c. 6.2	36.22 <sup>10</sup>	72.0 <sup>11</sup>	16.00 <sup>9</sup>	11.3 <sup>2</sup>	43.78 <sup>10</sup>	59.4 <sup>11</sup>	23.72 <sup>32</sup>	39.0 <sup>15</sup>
	7	13	5	1	8	14	24	19
16.1	36.15	70.7	15.95	11.4	43.70	58.0	23.48	37.1
26.1	36.12 <sup>3</sup>	69.2 <sup>15</sup>	15.93 <sup>2</sup>	11.4 <sup>0</sup>	43.66 <sup>4</sup>	56.5 <sup>15</sup>	23.32 <sup>16</sup>	34.8 <sup>23</sup>
36.1	36.11 <sup>1</sup>	67.6 <sup>16</sup>	15.94 <sup>1</sup>	11.3 <sup>1</sup>	43.66 <sup>0</sup>	54.8 <sup>17</sup>	23.26 <sup>6</sup>	32.3 <sup>25</sup>
$\delta$ , Tan $\delta$	1.032	+0.255	1.054	−0.333	1.038	+0.279	2.509	−2.301
n Place	33°.826	55''.61	12°.769	18''.57	41°.414	42''.38	18°.797	35''.31
$\alpha$ , $D_{\alpha} \alpha$	−0.01	−0.01	+0.01	+0.01	−0.01	−0.01	+0.05	+0.10
$\delta$ , $D_{\delta} \delta$	+0.2	−0.8	+0.2	−0.8	+0.2	−0.8	+0.3	−0.8

## FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\alpha$ Cygni. (Deneb.) Mag. 1.3		$\delta$ Delphini. Mag. 4.5		$\phi$ Capricorni. Mag. 4.3		$\gamma$ Delphini seq. Mag. 4.5	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Declina- tion N.	
	h m 20 38	° ' " +44 58	h m 20 39	° ' " +14 45	h m 20 41	° ' " -25 34	° ' " +15 48	
Jan. 1.1	30.43	36.7	28.66	65.9	3.44	45.9	60.8	
11.1	30.38 5	34.0 27	28.67 1	64.2 17	3.48 4	45.3 6	59.0 18	
21.0	30.38 0	31.1 29	28.72 5	62.5 17	3.56 8	44.7 6	57.3 17	
31.0	30.44 6	28.2 29	28.81 9	60.8 17	3.67 11	44.0 7	55.5 18	
Feb. 10.0	30.54 10	25.3 29	28.92 11	59.3 15	3.82 15	43.1 9	53.9 16	
	16	26	15	14	17	9	24	
19.9	30.70	22.7	29.07	57.9	3.99	42.2	52.5	
Mar. 1.9	30.90 20	20.3 24	29.25 18	56.8 11	4.20 21	41.1 11	51.3 12	
11.9	31.14 24	18.3 20	29.46 21	56.0 8	4.44 24	39.9 12	50.4 9	
21.9	31.43 29	16.8 15	29.70 24	55.5 5	4.70 26	38.7 12	49.9 5	
31.8	31.75 32	15.9 9	29.96 26	55.5 0	4.99 29	37.3 14	49.9 0	
	35	4	28	4	31	14	3	
Apr. 10.8	32.10	15.5	30.24	55.9	5.30	35.9		
20.8	32.47 37	15.7 2	30.54 30	56.7 8	5.62 32	34.5 14	1.0 8	
30.8	32.85 38	16.5 8	30.85 31	57.8 11	5.96 34	33.1 14	11	
May 10.7	33.23 38	17.8 13	31.16 31	59.4 16	6.31 35	31.7 14	15	
20.7	33.60 37	19.7 19	31.47 31	61.2 18	6.65 34	30.4 13	18	
	36	23	30	21	34	12	31	
30.7	33.96	22.0	31.77	63.3	6.99	29.2		
June 9.6	34.29 33	24.7 27	32.06 29	65.6 23	7.31 32	28.2 10	23	
19.6	34.59 30	27.7 30	32.33 27	67.9 23	7.61 30	27.4 8	24	
29.6	34.84 25	30.9 32	32.56 23	70.4 25	7.88 27	26.7 7	25	
July 9.6	35.05 21	34.3 34	32.76 20	72.8 24	8.12 24	26.3 4	25	
	15	34	16	24	19	2	24	
19.5	35.20	37.7	32.92	75.2	8.31	26.1		
29.5	35.29 9	41.1 34	33.04 12	77.5 23	8.46 15	26.1 0		
Aug. 8.5	35.33 4	44.4 33	33.11 7	79.6 21	8.56 10	26.2 1		
18.5	35.31 2	47.6 32	33.13 2	81.5 19	8.61 5	26.5 3		
28.4	35.24 7	50.5 29	33.12 1	83.2 17	8.61 0	27.0 5		
	12	27	6	15	5	6		
Sept. 7.4	35.12	53.2	33.06	84.7	8.56	27.6	9.4 12	
17.4	34.95 17	55.5 23	32.96 10	85.9 12	8.47 9	28.3 7	10.6 10	
27.3	34.74 21	57.4 19	32.84 12	86.8 9	8.35 12	28.9 6	11.6 6	
Oct. 7.3	34.51 23	58.9 15	32.70 14	87.4 6	8.21 14	29.6 7	12.2 6	
17.3	34.26 25	60.0 11	32.54 16	87.7 3	8.05 16	30.2 6	12.6 4	
	26	5	16	1	17	4	1	
27.3	34.00	60.5	32.38	87.8	7.88	30.6	12.7 2	
Nov. 6.2	33.75 25	60.6 1	32.22 16	87.5 3	7.72 16	31.0 4	12.5 2	
16.2	33.50 25	60.2 4	32.08 14	87.0 5	7.58 14	31.2 2	12.0 5	
26.2	33.27 23	59.2 10	31.95 13	86.2 8	7.45 13	31.3 1	11.1 9	
Dec. 6.2	33.07 20	57.8 14	31.85 10	85.1 11	7.35 10	31.2 1	10.1 10	
	16	19	8	13	6	2	13	
16.1	32.91	55.9	31.77	83.8	7.29	31.0	18.8 15	
26.1	32.79 12	53.7 22	31.73 4	82.3 15	7.26 3	30.7 3	17.3 15	
36.1	32.71 8	51.1 26	31.73 0	80.7 16	7.28 2	30.3 4	15.6 17	
Sec $\delta$ , Tan $\delta$	1.414	+0.999	1.034	+0.264	1.109	-0.479	1.039	+0.283
Mean Place	32° 02' 32"	33' 82"	29° 44' 32"	67' 98"	3° 03' 38"	36' 81"	42° 08' 11"	62' 44"
D' $\phi$ $\alpha$ , D $\alpha$ $\alpha$	-0.02	-0.04	-0.01	-0.01	+0.01	+0.02	-0.01	-0.01
D' $\phi$ $\delta$ , D $\alpha$ $\delta$	+0.3	-0.8	+0.3	-0.8	+0.3	-0.8	+0.3	-0.8

FOR THE UPPER TRANSIT AT WASHINGTON.

Solar etc.	ε Cygni. Mag. 2.6		ε Aquarii. Mag. 3.8		η Cephei. Mag. 3.6		μ Aquarii. Mag. 4.8	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 20 42 s	° ' " + 33 38 "	h m 20 43 s	° ' " − 9 48 "	h m 20 43 s	° ' " + 61 30 "	h m 20 48 s	° ' " − 9 17 "
l. 1.1	45.14	66.2	4.02	33.7	30.98	35.6	3.71	77.2
11.1	45.12 2	63.8 24	4.06 4	34.1 4	30.83 15	32.8 28	3.74 3	77.6 4
21.0	45.15 3	61.3 25	4.12 6	34.4 3	30.75 8	29.7 31	3.80 6	77.9 3
31.0	45.21 6	58.7 26	4.22 10	34.7 3	30.76 1	26.5 32	3.89 9	78.2 3
b. 10.0	45.31 10	56.3 24	4.35 13	34.8 1	30.85 9	23.3 32	4.02 13	78.3 1
	15	23	16	0	16	31	15	c
19.9	45.46	54.0	4.51	34.8	31.01	20.2	4.17	78.3
tr. 1.9	45.65 19	52.0 20	4.70 19	34.6 2	31.26 25	17.4 28	4.35 18	78.1 2
11.9	45.87 22	50.5 15	4.91 21	34.2 4	31.57 31	15.0 24	4.56 21	77.7 4
21.9	46.12 25	49.3 12	5.15 24	33.5 7	31.95 38	13.1 19	4.80 24	77.1 6
31.8	46.41 29	48.7 6	5.41 26	32.7 8	32.39 44	11.8 13	5.06 26	76.3 8
	31	2	29	10	47	8	28	11
tr. 10.8	46.72	48.5	5.70	31.7	32.86	11.0	5.34	75.2
20.8	47.04 32	48.9 4	6.00 30	30.4 13	33.36 50	10.9 1	5.64 30	74.0 12
30.8	47.38 34	49.9 10	6.31 31	29.1 13	33.88 52	11.4 5	5.95 31	72.6 14
ay 10.7	47.73 35	51.3 14	6.62 31	27.6 15	34.40 52	12.5 11	6.27 32	71.1 15
20.7	48.06 33	53.2 19	6.94 32	26.0 16	34.90 50	14.2 17	6.59 32	69.5 16
	33	22	31	16	47	22	31	16
30.7	48.39	55.4	7.25	24.4	35.37	16.4	6.90	67.9
me 9.6	48.70 31	58.0 26	7.55 30	22.8 16	35.81 44	19.1 27	7.20 30	66.3 16
19.6	48.98 28	60.9 29	7.83 28	21.3 15	36.19 38	22.2 31	7.48 28	64.7 16
29.6	49.22 24	63.9 30	8.08 25	19.8 15	36.50 31	25.5 33	7.73 25	63.2 15
ily 9.6	49.42 20	67.0 31	8.30 22	18.5 13	36.75 25	29.0 35	7.95 22	61.9 13
	16	31	18	11	17	37	18	12
19.5	49.58	70.1	8.48	17.4	36.92	32.7	8.13	60.7
29.5	49.69 11	73.2 31	8.61 13	16.5 9	37.01 9	36.4 37	8.27 14	59.7 10
ug. 8.5	49.75 6	76.2 30	8.71 10	15.7 8	37.02 1	40.1 37	8.37 10	58.9 8
18.5	49.76 1	79.0 28	8.75 4	15.1 6	36.95 7	43.7 36	8.42 5	58.3 6
28.4	49.72 4	81.5 25	8.75 0	14.7 4	36.80 15	47.0 33	8.42 0	57.9 4
	8	23	4	2	22	31	4	3
pt. 7.4	49.64	83.8	8.71	14.5	36.58	50.1	8.38	57.6
17.4	49.51 13	85.8 20	8.63 8	14.4 1	36.30 28	52.9 28	8.31 7	57.5 1
27.3	49.36 15	87.4 16	8.52 11	14.5 1	35.97 33	55.3 24	8.21 10	57.6 1
st. 7.3	49.18 18	88.7 13	8.39 13	14.7 2	35.59 38	57.2 19	8.08 13	57.7 1
17.3	48.98 20	89.5 8	8.25 14	14.9 2	35.19 40	58.7 15	7.94 14	57.9 2
	20	4	15	3	42	10	15	4
27.3	48.78	89.9	8.10	15.2	34.77	59.7	7.79	58.3
iv. 6.2	48.58 20	89.9 0	7.95 15	15.6 4	34.34 43	60.1 4	7.64 15	58.7 4
16.2	48.38 20	89.4 5	7.82 13	16.0 4	33.92 42	59.9 2	7.51 13	59.1 4
26.2	48.21 17	88.5 9	7.71 11	16.4 4	33.53 39	59.2 7	7.40 11	59.5 4
xc. 6.2	48.07 14	87.2 13	7.62 9	16.9 5	33.17 36	57.9 13	7.31 9	60.0 5
	12	16	6	4	32	18	6	4
16.1	47.95	85.6	7.56	17.3	32.85	56.1	7.25	60.4
26.1	47.87 8	83.6 20	7.54 2	17.8 5	32.59 26	53.8 23	7.22 3	60.9 5
36.1	47.82 5	81.3 23	7.55 1	18.2 4	32.40 19	51.2 26	7.22 0	61.3 4
δ, Tan δ	1.202	+0.666	1.015	−0.173	2.096	+1.842	1.013	−0.164
n Place	46°.314	64''.68	4°.555	27''.29	33°.778	30''.14	4°.231	70''.94
z, D <sub>α</sub> α	−0.01	−0.03	0.00	+0.01	−0.04	−0.08	0.00	+0.01
, D <sub>α</sub> δ	+0.3	−0.8	+0.3	−0.8	+0.3	−0.8	+0.3	−0.7



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date	$\beta$ Indi. Mag. 3.7		32 Vulpeculæ. Mag. 5.2		220 Draconis (Heis). Mag. 5.6		$\gamma$ Cygni. Mag. 4.0	
	Right Ascension	Declination S.	Right Ascension	Declination N.	Right Ascension	Declination N.	Right Ascension	Declination N.
	h m 20 48	° ' " -58 46	h m 20 50	° ' " +27 43	h m 20 51	° ' " +80 13	h m 20 53	° ' " +40 50
Jan. 1.1	9.75	45.0	55.23	62.7	19.87	71.1	58.84	25.2
11.1	9.74	42.6	55.22	60.6	19.18	68.4	58.79	22.6
21.0	9.81	40.1	55.24	58.3	18.70	65.3	58.79	19.9
31.0	9.95	37.5	55.30	56.0	18.47	62.1	58.83	17.2
Feb. 10.0	10.15	34.7	55.40	53.8	18.48	58.9	58.92	14.5
20.0	10.41	32.0	55.54	51.8	18.74	55.7	59.05	11.9
Mar. 1.9	10.73	29.4	55.71	50.1	19.23	52.7	59.23	9.6
11.9	11.10	26.8	55.92	48.7	19.94	50.0	59.45	7.7
21.9	11.52	24.4	56.15	47.7	20.85	47.7	59.71	6.3
31.8	11.98	22.1	56.42	47.2	21.91	46.0	60.00	5.3
Apr. 10.8	12.47	20.1	56.71	47.2	23.09	44.8	60.33	4.9
20.8	12.99	18.4	57.02	47.6	24.35	44.3	60.67	5.1
30.8	13.52	17.0	57.35	48.6	25.64	44.4	61.03	5.8
May 10.7	14.07	16.0	57.68	50.0	26.93	45.1	61.40	7.1
20.7	14.62	15.3	58.00	51.8	28.16	46.4	61.76	8.8
30.7	15.15	15.0	58.32	54.0	29.30	48.2	62.11	11.0
June 9.7	15.66	15.1	58.63	56.5	30.33	50.6	62.45	13.6
19.6	16.13	15.5	58.91	59.2	31.20	53.3	62.75	16.5
29.6	16.56	16.4	59.15	62.1	31.90	56.5	63.01	19.6
July 9.6	16.93	17.6	59.36	65.0	32.40	59.9	63.23	22.9
19.5	17.23	19.0	59.53	67.9	32.71	63.4	63.40	26.2
29.5	17.45	20.8	59.65	70.8	32.80	67.1	63.52	29.5
Aug. 8.5	17.60	22.7	59.72	73.5	32.68	70.8	63.59	32.7
18.5	17.66	24.7	59.75	76.1	32.35	74.4	63.60	35.8
28.4	17.64	26.8	59.73	78.4	31.82	78.0	63.56	38.7
Sept. 7.4	17.54	28.9	59.66	80.5	31.11	81.3	63.46	
17.4	17.37	30.8	59.56	82.3	30.23	84.3	63.33	
27.4	17.13	32.5	59.42	83.8	29.20	87.0	63.16	
Oct. 7.3	16.85	33.9	59.26	84.9	28.05	89.3	62.96	
17.3	16.54	34.9	59.09	85.6	26.79	91.2	62.74	
27.3	16.21	35.6	58.91	86.0	25.47	92.5	62.51	48.8
Nov. 6.2	15.88	35.8	58.72	85.9	24.12	93.3	62.28	49.0
16.2	15.56	35.5	58.55	85.5	22.76	93.6	62.06	48.7
26.2	15.28	34.8	58.39	84.7	21.44	93.2	61.86	47.9
Dec. 6.2	15.05	33.7	58.26	83.5	20.19	92.3	61.67	46.7
16.1	14.87	32.2	58.16	82.0	19.06	90.8	61.52	45.1
26.1	14.76	30.3	58.09	80.2	18.06	88.8	61.41	43.0
36.1	14.71	28.1	58.05	78.2	17.25	86.3	61.33	40.6
Sec $\delta$ , Tan $\delta$	1.929	-1.650	1.130	+0.526	5.896	+5.811	1.322	+0.864
Mean Place	10 <sup>h</sup> .556	31 <sup>m</sup> .82	56 <sup>h</sup> .225	61 <sup>m</sup> .69	28 <sup>h</sup> .984	63 <sup>m</sup> .12	60 <sup>h</sup> .218	21 <sup>m</sup> .60
D <sub>1</sub> $\alpha$ , D <sub>2</sub> $\alpha$	+0.03	+0.07	-0.01	-0.02	-0.11	-0.26	-0.08	-0.04
D <sub>1</sub> $\delta$ , D <sub>2</sub> $\delta$	+0.3	-0.7	+0.3	-0.7	+0.3	-0.7	+0.3	-0.7

(Rph 13)

FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	$\alpha$ Octantis. Mag. 5.2		$\gamma$ Microscopii. Mag. 4.7		$\theta$ Capricorni. Mag. 4.2		$\xi$ Cygni. Mag. 3.9	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 20 54 s	° ' " -77 20 "	h m 20 56 s	° ' " -32 35 "	h m 21 1 s	° ' " -17 34 "	h m 21 1 s	° ' " +43 35 "
n. 1.1	25.36	72.6	4.45	36.6	9.82	24.5	48.86	22.7
11.1	25.19 17	69.5 31	4.47 2	35.7 9	9.84 2	24.4 1	48.79 7	20.2 25
21.0	25.20 1	66.2 33	4.53 6	34.6 11	9.89 5	24.2 2	48.77 2	17.5 27
31.0	25.37 17	62.8 34	4.63 10	33.4 12	9.97 8	23.9 3	48.79 2	14.7 28
b. 10.0	25.71 34 50	59.4 34 34	4.76 13 17	32.1 13 14	10.09 12 15	23.5 4 5	48.87 8 12	11.9 28 26
20.0	26.21	56.0	4.93	30.7	10.24	23.0	48.99	9.3
ar. 1.9	26.85 64	52.7 33	5.14 21	29.1 16	10.41 17	22.3 7	49.16 17	6.9 24
11.9	27.62 77	49.6 31	5.37 23	27.5 16	10.62 21	21.4 9	49.38 22	4.8 21
21.9	28.50 88	46.8 28	5.64 27	25.9 16	10.85 23	20.4 10	49.64 26	3.2 16
31.8	29.48 98 106	44.3 25 21	5.94 30 31	24.2 17 16	11.11 26 29	19.2 12 13	49.94 30 33	2.1 11 5
pr. 10.8	30.54	42.2	6.25	22.6	11.40	17.9	50.27	1.6
20.8	31.66 112	40.4 18	6.59 34	21.0 16	11.70 30	16.5 14	50.63 36	1.6 0
30.8	32.82 116	39.1 13	6.95 36	19.4 16	12.02 32	14.9 16	51.00 37	2.2 6
ay 10.7	33.99 117	38.3 8	7.31 36	18.0 14	12.34 32	13.4 15	51.37 37	3.4 12
20.7	35.16 117 114	37.9 4 1	7.68 37 36	16.7 13 12	12.67 33 33	11.8 16 15	51.75 38 37	5.1 17 21
30.7	36.30	38.0	8.04	15.5	13.00	10.3	52.12	7.2
ne 9.7	37.38 108	38.6 6	8.39 35	14.6 9	13.32 32	8.9 14	52.46 34	9.7 25
19.6	38.37 99	39.6 10	8.71 32	14.0 6	13.62 30	7.6 13	52.78 32	12.6 29
29.6	39.26 89	41.1 15	9.01 30	13.6 4	13.89 27	6.4 12	53.06 28	15.7 31
ly 9.6	40.01 75 61	43.0 19 22	9.27 26 22	13.4 2 1	14.13 24 20	5.5 9 8	53.29 23 18	19.0 33 34
19.5	40.62	45.2	9.49	13.5	14.33	4.7	53.47	22.4
29.5	41.06 44	47.6 24	9.67 18	13.8 3	14.49 16	4.1 6	53.60 13	25.8 34
ig. 8.5	41.32 26	50.2 26	9.79 12	14.4 6	14.60 11	3.8 3	53.67 7	29.1 33
18.5	41.39 7	52.9 27	9.85 6	15.1 7	14.67 7	3.7 1	53.69 2	32.3 32
28.4	41.27 12 29	55.6 27 26	9.87 2 4	16.0 9 9	14.69 2 3	3.7 0 2	53.65 4 9	35.4 31 27
pt. 7.4	40.98	58.2	9.83	16.9	14.66	3.9	53.56	38.1
17.4	40.51 47	60.6 24	9.75 8	17.9 10	14.60 6	4.2 3	53.43 13	40.5 24
27.4	39.90 61	62.7 21	9.63 12	18.9 10	14.50 10	4.6 4	53.26 17	42.6 21
t. 7.3	39.17 73	64.3 16	9.48 15	19.8 9	14.37 13	5.1 5	53.05 21	44.3 17
17.3	38.35 82 88	65.5 12 7	9.31 17 18	20.6 8 6	14.23 14 15	5.5 4 5	52.83 22 24	45.6 13 8
27.3	37.47	66.2	9.13	21.2	14.08	6.0	52.59	46.4
iv. 6.2	36.58 89	66.3 1	8.96 17	21.6 4	13.93 15	6.5 5	52.34 25	46.7 3
16.2	35.72 86	65.8 5	8.79 17	21.9 3	13.79 14	6.9 4	52.11 23	46.5 2
26.2	34.92 80	64.7 11	8.65 14	21.9 0	13.67 12	7.2 3	51.89 22	45.9 6
c. 6.2	34.21 71 59	63.0 17 21	8.53 12 8	21.6 3 4	13.57 10 6	7.4 2 2	51.69 20 17	44.7 12 16
16.1	33.62	60.9	8.45	21.2	13.51	7.6	51.52	43.1
26.1	33.18 44	58.4 25	8.41 4	20.6 6	13.47 4	7.7 1	51.38 14	41.1 20
36.1	32.90 28	55.5 29	8.40 1	19.7 9	13.46 1	7.7 0	51.29 9	38.7 24
$\delta$ , Tan $\delta$	4.566	-4.455	1.187	-0.639	1.049	-0.317	1.381	+0.952
n Place	27°.658	58''.34	4°.887	26''.42	10°.251	16''.91	50°.312	18''.07
$\delta$ , D <sub>0</sub> $\alpha$	+0.09	+0.20	+0.01	+0.03	+0.01	+0.02	-0.02	-0.05
$\delta$ , D <sub>0</sub> $\delta$	+0.3	-0.7	+0.3	-0.7	+0.3	-0.7	+0.3	-0.7

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	61 Cygni <i>pr.</i> Mag. 5.6			♈ Aquarii. Mag. 4.5			Bradley 2777. Mag. 5.9			♐ Piscis Australis. Mag. 5.6		
	Right Ascension.		Declina- tion N.	Right Ascension.		Declina- tion S.	Right Ascension.		Declina- tion N.	Right Ascension.		Declina- tion S.
	h	m	° ' "	h	m	° ' "	h	m	° ' "	h	m	° ' "
	21	3	+38 19	21	4	—11 42	21	7	+77 46	21	8	—27 57
	s		"	s		"	s		"	s		"
Jan. 1.1	3.83		54.5	57.46		65.3	6.52		64.3	14.70		69.5
11.1	3.79	4	52.1 24	57.48	2	65.6 3	5.93	59	61.7 26	14.71	1	68.8 7
21.0	3.80	1	49.6 25	57.52	4	65.8 2	5.52	41	58.7 30	14.75	4	68.0 8
31.0	3.85	5	47.1 25	57.60	8	65.8 0	5.28	24	55.5 32	14.83	8	67.1 9
Feb. 10.0	3.94	9	44.6 25	57.71	11	65.8 0	5.24	4	52.3 32	14.95	12	66.0 11
		13	23		14	2		16	32		15	12
20.0	4.07		42.3	57.85		65.6	5.40		49.1	15.10		64.8
Mar. 1.9	4.25	18	40.2 21	58.01	16	65.2 4	5.75	35	46.0 31	15.28	18	63.5 13
11.9	4.48	23	38.4 18	58.21	20	64.6 6	6.28	53	43.2 28	15.50	22	62.0 15
21.9	4.74	26	37.1 13	58.44	23	63.8 8	6.96	68	40.9 23	15.74	24	60.5 15
31.9	5.03	29	36.3 8	58.69	25	62.8 10	7.79	83	39.0 19	16.02	28	58.9 16
		32	2		27	11		93	13		29	16
Apr. 10.8	5.35		36.1	58.96		61.7	8.72		37.7	16.31		57.3
20.8	5.70	35	36.4 3	59.25	29	60.4 13	9.73	101	37.0 7	16.63	32	55.6 17
30.8	6.06	36	37.2 8	59.56	31	58.9 15	10.78	105	36.9 1	16.97	34	54.0 16
May 10.7	6.43	37	38.6 14	59.88	32	57.3 16	11.84	106	37.4 5	17.32	35	52.4 16
20.7	6.79	36	40.4 18	60.20	32	55.7 16	12.87	103	38.6 12	17.67	35	50.9 15
		36	23		32	17		97	17		35	13
30.7	7.15		42.7	60.52		54.0	13.84		40.3	18.02		49.6
June 9.7	7.49	34	45.4 27	60.83	31	52.4 16	14.73	89	42.5 22	18.36	34	48.5 11
19.6	7.79	30	48.3 29	61.12	29	50.8 16	15.51	78	45.2 27	18.68	32	47.5 10
29.6	8.07	28	51.4 31	61.39	27	49.4 14	16.15	64	48.3 31	18.98	30	46.8 7
July 9.6	8.30	23	54.7 33	61.63	24	48.1 13	16.65	50	51.6 33	19.24	26	46.3 5
		18	34		20	11		34	36		23	2
19.6	8.48		58.1	61.83		47.0	16.99		55.2	19.47		46.1
29.5	8.62	14	61.4 33	61.99	16	46.1 9	17.16	17	58.9 37	19.64	17	46.1 0
Aug. 8.5	8.70	8	64.7 33	62.10	11	45.4 7	17.16	0	62.6 37	19.77	13	46.4 3
18.5	8.73	3	67.8 31	62.16	6	44.9 5	17.00	16	66.4 38	19.85	8	46.9 5
28.4	8.71	2	70.7 29	62.18	2	44.6 3	16.67	33	70.0 36	19.87	2	47.5 6
		6	26		2	1		49	34		2	7
Sept. 7.4	8.65		73.3	62.16		44.5	16.18		73.4	19.85		48.2
17.4	8.54	11	75.6 23	62.10	6	44.5 0	15.56	62	76.6 32	19.79	6	49.0 8
27.4	8.39	15	77.6 20	62.01	9	44.7 2	14.81	75	79.5 29	19.69	10	49.9 9
Oct. 7.3	8.22	17	79.2 16	61.89	12	44.9 2	13.95	86	81.9 24	19.55	14	49.9 8
17.3	8.02	20	80.3 11	61.75	14	45.2 3	13.01	94	84.0 21	19.40	15	50.7 8
		20	8		14	4		101	15		16	7
27.3	7.82		81.1	61.61		45.6	12.00		85.5	19.24		52.2
Nov. 6.3	7.61	21	81.3 2	61.47	14	46.1 5	10.95	105	86.6 11	19.07	17	52.7 5
16.2	7.41	20	81.1 2	61.33	14	46.5 4	9.90	105	87.0 4	18.92	15	53.0 3
26.2	7.23	18	80.5 6	61.21	12	46.9 4	8.86	104	86.9 1	18.78	14	53.2 2
Dec. 6.2	7.07	16	79.4 11	61.12	9	47.3 4	7.87	99	86.1 8	18.67	11	53.2 0
		14	15		7	4		91	13		9	2
16.1	6.93		77.9	61.05		47.7	6.96		84.8	18.58		53.0
26.1	6.83	10	76.0 19	61.01	4	48.0 3	6.15	81	82.9 19	18.53	5	52.6 4
36.1	6.77	6	73.8 22	61.00	1	48.3 3	5.48	67	80.6 23	18.52	1	52.0 0
Sec δ, Tan δ	1.275		+0.791	1.021		—0.207	4.726		+4.619	1.132		—0.531
Mean Place	5 <sup>s</sup> .095		50 <sup>''</sup> .90	57 <sup>s</sup> .907		58 <sup>''</sup> .97	13 <sup>s</sup> .487		54 <sup>''</sup> .83	15 <sup>s</sup> .080		59 <sup>''</sup> .99
D'ψ α, Dω α	—0.01		—0.04	0.00		+0.01	—0.08		—0.22	+0.01		+0.03
Dψ δ, Dω δ	+0.3		—0.7	+0.3		—0.7	+0.3		—0.7	+0.3		—0.7

FOR THE UPPER TRANSIT AT WASHINGTON.

Solar date.	ζ Cygni. Mag. 3.4		τ Cygni. Mag. 3.8		α Equulei. Mag. 4.1		σ Cygni. Mag. 4.3	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 21 9	° ' + 29 52	h m 21 11	° ' + 37 40	h m 21 11	° ' + 4 53	h m 21 14	° ' + 39 2
	s 18.09	" 42.4	s 22.65	" 59.9	s 33.95	" 42.5	s 3.37	" 21.9
. 1.1	18.06 3	40.2 22	22.60 5	57.6 23	33.95 0	41.3 12	3.30 7	19.6 23
11.1	18.06 0	38.0 22	22.58 2	55.1 25	33.98 3	40.2 11	3.28 2	17.1 25
21.0	18.10 4	35.7 23	22.61 3	52.5 26	34.04 6	39.2 10	3.30 2	14.4 27
31.0	18.17 7	33.4 23	22.67 6	50.0 25	34.13 9	38.2 10	3.36 6	11.8 26
10.0	18.17 12	31.3 21	22.78 11	47.5 25	34.25 12	37.4 8	3.36 11	9.3 25
20.0	18.29 15	29.5 18	22.78 16	45.3 22	34.25 16	36.9 5	3.47 15	7.1 22
r. 1.9	18.44 19	27.9 16	22.94 20	43.5 18	34.41 18	36.6 3	3.62 20	5.2 19
11.9	18.63 23	26.8 11	23.14 24	42.1 14	34.59 21	36.6 0	3.82 24	3.7 15
21.9	18.86 26	26.1 7	23.38 27	41.1 10	34.80 24	36.9 3	4.06 27	2.6 11
31.9	19.12 28	25.9 2	23.65 30	40.7 4	35.04 26	37.5 6	4.33 31	2.1 5
10.8	19.40 31	26.3 4	23.95 33	40.8 1	35.30 28	38.5 10	4.64 33	2.2 1
20.8	19.71 33	27.1 8	24.28 35	41.5 7	35.58 30	39.7 12	4.97 35	2.8 6
30.8	20.04 33	28.4 13	24.63 36	42.7 12	35.88 31	41.3 16	5.32 36	3.9 11
y 10.7	20.37 34	30.1 17	24.99 36	44.3 16	36.19 31	43.0 17	5.68 36	5.5 16
20.7	20.71 33	32.2 21	25.35 35	46.4 21	36.51 31	44.9 19	6.04 36	7.6 21
30.7	21.04 32	34.6 24	25.70 33	48.9 25	36.82 30	47.0 21	6.40 34	10.1 25
ne 9.7	21.36 29	37.2 26	26.03 31	51.7 28	37.12 28	49.1 21	6.74 31	12.8 27
19.6	21.65 26	40.1 29	26.34 27	54.7 30	37.40 26	51.2 21	7.05 28	15.8 30
29.6	21.91 23	43.1 29	26.61 24	57.8 31	37.66 23	53.3 21	7.33 24	19.0 32
ly 9.6	22.14 19	46.0 30	26.85 19	61.1 33	37.89 19	55.3 20	7.57 20	22.2 32
19.6	22.33 14	49.0 30	27.04 14	64.3 32	38.08 16	57.1 18	7.77 14	25.5 33
29.5	22.47 9	51.9 29	27.18 9	67.5 32	38.24 11	58.8 17	7.91 9	28.7 32
ug. 8.5	22.56 4	54.6 27	27.27 4	70.6 31	38.35 6	60.2 14	8.00 4	31.8 31
18.5	22.60 0	57.1 25	27.31 1	73.4 28	38.41 2	61.5 13	8.04 1	34.7 29
28.4	22.60 5	59.4 23	27.30 6	76.0 26	38.43 2	62.5 10	8.03 6	37.4 27
pt. 7.4	22.55 9	61.4 20	27.24 11	78.3 23	38.41 6	63.3 8	7.97 11	39.8 24
17.4	22.46 12	63.0 16	27.13 14	80.3 20	38.35 9	63.9 6	7.86 14	41.8 20
27.4	22.34 15	64.3 13	26.99 17	81.9 16	38.26 12	64.3 4	7.72 17	43.4 16
st. 7.3	22.19 17	65.3 10	26.82 19	83.1 12	38.14 13	64.5 2	7.55 20	44.7 13
17.3	22.02 18	65.8 5	26.63 20	83.9 8	38.01 14	64.4 1	7.35 21	45.5 8
27.3	21.84 18	66.0 2	26.43 21	84.2 3	37.87 14	64.2 2	7.14 21	45.9 4
ov. 6.3	21.66 18	65.7 3	26.22 21	84.1 1	37.73 14	63.8 4	6.93 21	45.8 1
16.2	21.48 16	65.0 7	26.01 19	83.5 6	37.59 12	63.2 6	6.72 20	45.2 6
26.2	21.32 15	64.0 10	25.82 17	82.4 11	37.47 10	62.4 8	6.52 18	44.2 10
ec. 6.2	21.17 12	62.6 14	25.65 15	81.0 14	37.37 8	61.5 9	6.34 15	42.7 15
16.1	21.05 9	60.9 17	25.50 12	79.1 19	37.29 5	60.5 10	6.19 13	40.9 18
26.1	20.96 6	58.9 20	25.38 8	77.0 21	37.24 2	59.4 11	6.06 8	38.7 22
36.1	20.90		25.30		37.22		5.98	
δ, Tan δ	1.153	+0.575	1.264	+0.772	1.004	+0.086	1.288	+0.811
in Place	19°.072	39'' .67	23°.848	55'' .52	34°.507	45'' .02	4°.592	17'' .08
α, D <sub>α</sub> α	-0.01	-0.03	-0.01	-0.04	0.00	0.00	-0.01	-0.04
δ, D <sub>δ</sub> δ	+0.3	-0.7	+0.3	-0.7	+0.3	-0.7	+0.3	-0.7

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.		$\delta$
		Asc
		1
		2
		3
Jan.	1.1	19
	11.1	19
	21.1	19
	31.0	19
Feb.	10.0	19
	20.0	19
Mar.	1.9	19
	11.9	20
	21.9	20
	31.9	20
Apr.	10.8	20
	20.8	21
	30.8	21
May	10.8	22
	20.7	22
	30.7	22
June	9.7	23
	19.6	23
	29.6	23
July	9.6	24
	19.6	24
	29.5	24
Aug.	8.5	24
	18.5	25
	28.5	25
Sept.	7.4	25
	17.4	24
	27.4	24
Oct.	7.3	24
	17.3	24
	27.3	24
Nov.	6.3	24
	16.2	23
	26.2	23
Dec.	6.2	23
	16.2	23
	26.1	23
	36.1	23
Sec $\delta$ , Tan $\delta$		
Mean Place		1
$D'_{\delta} a, D_{\delta} a$		
$D'_{\delta} \delta, D_{\delta} \delta$		

FOR THE UPPER TRANSIT AT WASHINGTON.

Solar date.	γ Pavonis. Mag. 4.3		ζ Capricorni. Mag. 3.9		g Cygni. Mag. 5.3		β Aquarii. Mag. 3.1	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.
	h m 21 19	° ' " — 65 44	h m 21 21	° ' " — 22 46	h m 21 26	° ' " + 46 9	h m 21 27	° ' " — 5 56
	s	"	s	"	s	"	s	"
l. 1.1	25.08	81.1	48.70	56.8	17.26	62.7	4.73	49.1
11.1	24.98 <sup>10</sup>	78.5 <sup>26</sup>	48.70 <sup>0</sup>	56.4 <sup>4</sup>	17.16 <sup>10</sup>	60.3 <sup>24</sup>	4.72 <sup>1</sup>	49.7 <sup>6</sup>
21.1	24.97 <sup>1</sup>	75.7 <sup>28</sup>	48.73 <sup>3</sup>	55.9 <sup>5</sup>	17.10 <sup>6</sup>	57.7 <sup>26</sup>	4.74 <sup>2</sup>	50.2 <sup>5</sup>
31.0	25.04 <sup>7</sup>	72.7 <sup>30</sup>	48.79 <sup>6</sup>	55.3 <sup>6</sup>	17.09 <sup>1</sup>	54.9 <sup>28</sup>	4.79 <sup>5</sup>	50.5 <sup>3</sup>
b. 10.0	25.19 <sup>15</sup>	69.6 <sup>31</sup>	48.89 <sup>10</sup>	54.5 <sup>8</sup>	17.13 <sup>4</sup>	52.1 <sup>28</sup>	4.88 <sup>9</sup>	50.8 <sup>3</sup>
	23	32	13	9	9	27	11	1
20.0	25.42	66.4	49.02	53.6	17.22	49.4	4.99	50.9
ar. 1.9	25.73 <sup>31</sup>	63.2 <sup>32</sup>	49.18 <sup>16</sup>	52.5 <sup>11</sup>	17.36 <sup>14</sup>	46.8 <sup>26</sup>	5.13 <sup>14</sup>	50.8 <sup>1</sup>
11.9	26.11 <sup>38</sup>	60.2 <sup>30</sup>	49.37 <sup>19</sup>	51.3 <sup>12</sup>	17.56 <sup>20</sup>	44.6 <sup>22</sup>	5.30 <sup>17</sup>	50.5 <sup>3</sup>
21.9	26.56 <sup>45</sup>	57.2 <sup>30</sup>	49.60 <sup>23</sup>	49.9 <sup>14</sup>	17.80 <sup>24</sup>	42.8 <sup>18</sup>	5.50 <sup>20</sup>	49.9 <sup>6</sup>
31.9	27.06 <sup>50</sup>	54.5 <sup>27</sup>	49.85 <sup>25</sup>	48.4 <sup>15</sup>	18.09 <sup>29</sup>	41.4 <sup>14</sup>	5.73 <sup>23</sup>	49.1 <sup>8</sup>
	56	24	28	16	32	8	26	10
pr. 10.8	27.62	52.1	50.13	46.8	18.41	40.6	5.99	48.1
20.8	28.22 <sup>60</sup>	49.9 <sup>22</sup>	50.43 <sup>30</sup>	45.2 <sup>16</sup>	18.77 <sup>36</sup>	40.4 <sup>2</sup>	6.27 <sup>28</sup>	46.8 <sup>13</sup>
30.8	28.85 <sup>63</sup>	48.1 <sup>18</sup>	50.75 <sup>32</sup>	43.5 <sup>17</sup>	19.15 <sup>38</sup>	40.7 <sup>3</sup>	6.57 <sup>30</sup>	45.4 <sup>14</sup>
ay 10.8	29.50 <sup>65</sup>	46.7 <sup>14</sup>	51.08 <sup>33</sup>	41.8 <sup>17</sup>	19.54 <sup>39</sup>	41.6 <sup>9</sup>	6.88 <sup>31</sup>	43.7 <sup>17</sup>
20.7	30.16 <sup>66</sup>	45.7 <sup>10</sup>	51.42 <sup>34</sup>	40.2 <sup>16</sup>	19.93 <sup>39</sup>	43.1 <sup>15</sup>	7.20 <sup>32</sup>	42.0 <sup>17</sup>
	66	5	34	16	39	19	32	18
30.7	30.82	45.2	51.76	38.6	20.32	45.0	7.52	40.2
ine 9.7	31.46 <sup>64</sup>	45.1 <sup>1</sup>	52.09 <sup>33</sup>	37.2 <sup>14</sup>	20.70 <sup>38</sup>	47.4 <sup>24</sup>	7.83 <sup>31</sup>	38.3 <sup>19</sup>
19.6	32.06 <sup>60</sup>	45.4 <sup>3</sup>	52.41 <sup>32</sup>	36.0 <sup>12</sup>	21.04 <sup>34</sup>	50.1 <sup>27</sup>	8.12 <sup>29</sup>	36.5 <sup>18</sup>
29.6	32.61 <sup>55</sup>	46.1 <sup>7</sup>	52.70 <sup>29</sup>	35.0 <sup>10</sup>	21.35 <sup>31</sup>	53.1 <sup>30</sup>	8.40 <sup>28</sup>	34.8 <sup>17</sup>
ly 9.6	33.10 <sup>49</sup>	47.3 <sup>12</sup>	52.96 <sup>26</sup>	34.2 <sup>8</sup>	21.62 <sup>27</sup>	56.4 <sup>33</sup>	8.64 <sup>24</sup>	33.2 <sup>16</sup>
	41	16	23	6	21	34	21	15
19.6	33.51	48.9	53.19	33.6	21.83	59.8	8.85	31.7
29.5	33.84 <sup>33</sup>	50.7 <sup>18</sup>	53.37 <sup>18</sup>	33.3 <sup>3</sup>	22.00 <sup>17</sup>	63.2 <sup>34</sup>	9.02 <sup>17</sup>	30.4 <sup>13</sup>
ig. 8.5	34.06 <sup>22</sup>	52.8 <sup>21</sup>	53.51 <sup>14</sup>	33.2 <sup>1</sup>	22.10 <sup>10</sup>	66.7 <sup>35</sup>	9.15 <sup>13</sup>	29.3 <sup>11</sup>
18.5	34.19 <sup>13</sup>	55.1 <sup>23</sup>	53.60 <sup>9</sup>	33.3 <sup>1</sup>	22.15 <sup>5</sup>	70.0 <sup>33</sup>	9.24 <sup>9</sup>	28.4 <sup>9</sup>
28.5	34.21 <sup>2</sup>	57.5 <sup>24</sup>	53.64 <sup>4</sup>	33.6 <sup>3</sup>	22.14 <sup>1</sup>	73.2 <sup>32</sup>	9.28 <sup>4</sup>	27.7 <sup>7</sup>
	8	24	1	5	6	30	0	4
pt. 7.4	34.13	59.9	53.63	34.1	22.08	76.2	9.28	27.3
17.4	33.96 <sup>17</sup>	62.1 <sup>22</sup>	53.58 <sup>5</sup>	34.7 <sup>6</sup>	21.97 <sup>11</sup>	78.9 <sup>27</sup>	9.24 <sup>4</sup>	27.0 <sup>3</sup>
27.4	33.70 <sup>26</sup>	64.2 <sup>21</sup>	53.50 <sup>8</sup>	35.4 <sup>7</sup>	21.81 <sup>16</sup>	81.3 <sup>24</sup>	9.16 <sup>8</sup>	26.9 <sup>1</sup>
t. 7.3	33.37 <sup>33</sup>	66.0 <sup>18</sup>	53.38 <sup>12</sup>	36.1 <sup>7</sup>	21.62 <sup>19</sup>	83.2 <sup>19</sup>	9.06 <sup>10</sup>	26.9 <sup>0</sup>
17.3	32.99 <sup>38</sup>	67.4 <sup>14</sup>	53.24 <sup>14</sup>	36.8 <sup>7</sup>	21.40 <sup>22</sup>	84.8 <sup>16</sup>	8.94 <sup>12</sup>	27.1 <sup>2</sup>
	42	10	15	6	23	12	14	3
27.3	32.57	68.4	53.09	37.4	21.17	86.0	8.80	27.4
iv. 6.3	32.14 <sup>43</sup>	68.9 <sup>5</sup>	52.94 <sup>15</sup>	38.0 <sup>6</sup>	20.92 <sup>25</sup>	86.6 <sup>6</sup>	8.66 <sup>14</sup>	27.8 <sup>4</sup>
16.2	31.71 <sup>43</sup>	68.9 <sup>0</sup>	52.79 <sup>15</sup>	38.4 <sup>4</sup>	20.68 <sup>24</sup>	86.8 <sup>2</sup>	8.53 <sup>13</sup>	28.3 <sup>5</sup>
26.2	31.30 <sup>41</sup>	68.4 <sup>5</sup>	52.66 <sup>13</sup>	38.7 <sup>3</sup>	20.44 <sup>24</sup>	86.4 <sup>4</sup>	8.41 <sup>12</sup>	28.8 <sup>5</sup>
c. 6.2	30.94 <sup>36</sup>	67.3 <sup>11</sup>	52.55 <sup>11</sup>	38.9 <sup>2</sup>	20.22 <sup>22</sup>	85.5 <sup>9</sup>	8.31 <sup>10</sup>	29.3 <sup>5</sup>
	30	15	9	0	20	13	8	6
16.2	30.64	65.8	52.46	38.9	20.02	84.2	8.23	29.9
26.1	30.41 <sup>23</sup>	63.8 <sup>20</sup>	52.41 <sup>5</sup>	38.8 <sup>1</sup>	19.86 <sup>16</sup>	82.4 <sup>18</sup>	8.17 <sup>6</sup>	30.4 <sup>5</sup>
36.1	30.25 <sup>16</sup>	61.4 <sup>24</sup>	52.38 <sup>3</sup>	38.6 <sup>2</sup>	19.73 <sup>13</sup>	80.2 <sup>22</sup>	8.14 <sup>3</sup>	31.0 <sup>6</sup>
δ, Tan δ	2.435	−2.220	1.085	−0.420	1.444	+1.042	+1.005	−0.104
n Place	25°.871	66''.49	49°.032	48''.36	18°.716	55''.50	5°.123	44''.59
α, Dα α	+0.04	+0.11	+0.01	+0.02	−0.02	−0.05	0.00	+0.01
δ, Dα δ	+0.3	−0.6	+0.3	−0.6	+0.3	−0.6	+0.3	−0.6



## FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date	$\beta$ Cephei. Mag. 3.3		$\epsilon$ Aquarii. Mag. 4.8		74 Cygni. Mag. 5.1		$\gamma$ Capricorni. Mag. 3.8	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m s	° ' "	h m s	° ' "	h m s	° ' "	h m s	° ' "
	21 27	+70 10	21 33	- 8 13	21 33	+40 1	21 35	-17
Jan. 1.1	30.27	85 5	13.34	74.3	31.31	58.8	22.73	55.2
11.1	29.91 <sup>36</sup>	83 0 <sup>25</sup>	13.33 <sup>1</sup>	74.7 <sup>4</sup>	31.23 <sup>8</sup>	56.6 <sup>22</sup>	22.72 <sup>1</sup>	55.2
21.1	29.65 <sup>26</sup>	80.1 <sup>29</sup>	13.35 <sup>2</sup>	75.1 <sup>4</sup>	31.18 <sup>5</sup>	54.2 <sup>24</sup>	22.73 <sup>1</sup>	55.0
31.0	29.50 <sup>15</sup>	77 0 <sup>31</sup>	13.40 <sup>5</sup>	75.3 <sup>2</sup>	31.18 <sup>0</sup>	51.6 <sup>26</sup>	22.78 <sup>5</sup>	54.7
Feb. 10.0	29.46 <sup>4</sup>	73.8 <sup>32</sup>	13.47 <sup>7</sup>	75.4 <sup>1</sup>	31.21 <sup>3</sup>	49.0 <sup>26</sup>	22.86 <sup>8</sup>	54.2
20.0	29.54 <sup>19</sup>	70.6 <sup>31</sup>	13.58 <sup>11</sup>	75.3 <sup>1</sup>	31.30 <sup>9</sup>	46.5 <sup>25</sup>	22.97 <sup>11</sup>	53.6
Mar. 2.0	29.73 <sup>31</sup>	67.5 <sup>28</sup>	13.72 <sup>14</sup>	75.1 <sup>2</sup>	31.43 <sup>13</sup>	44.2 <sup>23</sup>	23.11 <sup>14</sup>	52.8
11.9	30.04 <sup>41</sup>	64.7 <sup>24</sup>	13.89 <sup>17</sup>	74.6 <sup>5</sup>	31.61 <sup>18</sup>	42.2 <sup>20</sup>	23.29 <sup>18</sup>	51.9
21.9	30.45 <sup>51</sup>	62.3 <sup>19</sup>	14.08 <sup>19</sup>	73.9 <sup>7</sup>	31.83 <sup>22</sup>	40.6 <sup>16</sup>	23.49 <sup>20</sup>	50.8
31.9	30.96 <sup>58</sup>	60.4 <sup>14</sup>	14.31 <sup>23</sup>	73.0 <sup>9</sup>	32.08 <sup>25</sup>	39.4 <sup>12</sup>	23.72 <sup>23</sup>	49.5
Apr. 10.8	31.54 <sup>64</sup>	59.0 <sup>9</sup>	14.56 <sup>28</sup>	71.9 <sup>13</sup>	32.38 <sup>33</sup>	38.7 <sup>1</sup>	23.98 <sup>33</sup>	
20.8	32.18 <sup>68</sup>	58.1 <sup>2</sup>	14.84 <sup>30</sup>	70.6 <sup>15</sup>	32.71 <sup>35</sup>	38.6 <sup>4</sup>	24.27 <sup>33</sup>	
30.8	32.86 <sup>70</sup>	57.9 <sup>11</sup>	15.14 <sup>31</sup>	69.1 <sup>17</sup>	33.06 <sup>37</sup>	39.0 <sup>14</sup>	24.57 <sup>33</sup>	
May 10.8	33.56 <sup>69</sup>	58.3 <sup>16</sup>	15.45 <sup>32</sup>	67.4 <sup>18</sup>	33.42 <sup>37</sup>	40.0 <sup>19</sup>	24.89 <sup>33</sup>	
20.7	34.25 <sup>67</sup>	59.4 <sup>21</sup>	15.77 <sup>32</sup>	65.6 <sup>18</sup>	33.79 <sup>37</sup>	41.4 <sup>19</sup>	25.22 <sup>33</sup>	
30.7	34.92 <sup>63</sup>	61.0 <sup>21</sup>	16.09 <sup>32</sup>	63.8 <sup>18</sup>	34.16 <sup>35</sup>	43.3 <sup>24</sup>	25.55 <sup>33</sup>	
June 9.7	35.55 <sup>57</sup>	63.1 <sup>26</sup>	16.41 <sup>30</sup>	62.0 <sup>17</sup>	34.51 <sup>33</sup>	45.7 <sup>26</sup>	25.88 <sup>31</sup>	
19.7	36.12 <sup>50</sup>	65.7 <sup>30</sup>	16.71 <sup>28</sup>	60.3 <sup>17</sup>	34.84 <sup>30</sup>	48.3 <sup>29</sup>	26.19 <sup>30</sup>	
29.6	36.62 <sup>41</sup>	68.7 <sup>33</sup>	16.99 <sup>25</sup>	58.6 <sup>15</sup>	35.14 <sup>26</sup>	51.2 <sup>32</sup>	26.49 <sup>26</sup>	
July 9.6	37.03 <sup>32</sup>	72.0 <sup>36</sup>	17.24 <sup>22</sup>	57.1 <sup>14</sup>	35.40 <sup>22</sup>	54.4 <sup>32</sup>	26.75 <sup>23</sup>	
19.6	37.35 <sup>21</sup>	75 6 <sup>37</sup>	17.46 <sup>18</sup>	55.7 <sup>12</sup>	35.62 <sup>17</sup>	57.6 <sup>33</sup>	26.98 <sup>19</sup>	33.0
29.5	37.56 <sup>10</sup>	79.3 <sup>38</sup>	17.64 <sup>13</sup>	54.5 <sup>10</sup>	35.79 <sup>12</sup>	60.9 <sup>33</sup>	27.17 <sup>19</sup>	32.3
Aug. 8.5	37 66 <sup>1</sup>	83.1 <sup>37</sup>	17.77 <sup>9</sup>	53.5 <sup>7</sup>	35.91 <sup>6</sup>	64.2 <sup>31</sup>	27.31 <sup>14</sup>	31.8
18.5	37 65 <sup>11</sup>	86.8 <sup>37</sup>	17.86 <sup>5</sup>	52.8 <sup>6</sup>	35.97 <sup>2</sup>	67.3 <sup>30</sup>	27.41 <sup>10</sup>	31.6
28.5	37.54 <sup>21</sup>	90.5 <sup>35</sup>	17.91 <sup>1</sup>	52.2 <sup>3</sup>	35.99 <sup>4</sup>	70.3 <sup>28</sup>	27.46 <sup>5</sup>	31.6
Sept. 7.4	37.33 <sup>31</sup>	94.0 <sup>33</sup>	17.92 <sup>4</sup>	51.9 <sup>2</sup>	35.95 <sup>9</sup>	73.1 <sup>25</sup>	27.47 <sup>3</sup>	31.7
17.4	37.02 <sup>39</sup>	97.3 <sup>30</sup>	17.88 <sup>7</sup>	51.7 <sup>0</sup>	35.86 <sup>12</sup>	75.6 <sup>22</sup>	27.44 <sup>8</sup>	32.0
27.4	36.63 <sup>46</sup>	100.3 <sup>26</sup>	17.81 <sup>10</sup>	51.7 <sup>2</sup>	35.74 <sup>16</sup>	77.8 <sup>19</sup>	27.36 <sup>10</sup>	32.5
Oct. 7.4	36.17 <sup>52</sup>	102.9 <sup>17</sup>	17.71 <sup>13</sup>	51.9 <sup>3</sup>	35.58 <sup>20</sup>	79.7 <sup>10</sup>	27.26 <sup>14</sup>	33.0
17.3	35.65 <sup>57</sup>	105 1 <sup>13</sup>	17.59 <sup>13</sup>	52.2 <sup>3</sup>	35.40 <sup>20</sup>	81.2 <sup>10</sup>	27.14 <sup>14</sup>	33.6
27.3	35.08 <sup>59</sup>	106.8 <sup>12</sup>	17.46 <sup>13</sup>	52.5 <sup>4</sup>	35.20 <sup>21</sup>	82.2 <sup>6</sup>	27.00 <sup>14</sup>	34.1
Nov. 6.3	34.49 <sup>61</sup>	108.0 <sup>6</sup>	17.33 <sup>13</sup>	52.9 <sup>5</sup>	34.99 <sup>21</sup>	82.8 <sup>1</sup>	26.86 <sup>14</sup>	34.1
16.2	33.88 <sup>61</sup>	108.6 <sup>0</sup>	17.20 <sup>13</sup>	53.4 <sup>5</sup>	34.78 <sup>20</sup>	82.9 <sup>4</sup>	26.72 <sup>12</sup>	35.1
26.2	33.27 <sup>57</sup>	108.0 <sup>11</sup>	17.07 <sup>10</sup>	53 9 <sup>5</sup>	34.58 <sup>19</sup>	82.5 <sup>8</sup>	26.60 <sup>11</sup>	35.1
Dec. 6.2	32.70 <sup>54</sup>	106.9 <sup>17</sup>	16.97 <sup>8</sup>	54.4 <sup>5</sup>	34.39 <sup>17</sup>	81.7 <sup>13</sup>	26.49 <sup>9</sup>	36.1
16.2	32.16 <sup>49</sup>	105.2 <sup>23</sup>	16.89 <sup>6</sup>	54.9 <sup>5</sup>	34.22 <sup>14</sup>	80.4 <sup>17</sup>	26.40 <sup>6</sup>	36.1
26.1	31.67 <sup>41</sup>	102.9 <sup>23</sup>	16.83 <sup>3</sup>	55.4 <sup>5</sup>	34.08 <sup>10</sup>	78.7 <sup>20</sup>	26.34 <sup>3</sup>	36.1
36.1	31.26		16.80	55.9	33.98	76.7	26.31	36.1
Sec $\delta$ , Tan $\delta$	2 951	+2.776	1.010	-0.145	1.306	+0.840	1.046	-0.3
Mean Place	34°.161	74°.66	13°.698	69°.39	32°.484	52°.10	23°.022	48°.2
$D'\phi\alpha$ , $D_\alpha\alpha$	-0.05	-0.15	0.00	+0.01	-0.01	-0.04	0.00	+0.03
$D'\phi\delta$ , $D_\delta\delta$	+0.3	-0.6	+0.3	-0.6	+0.3	-0.6	+0.3	-0.6

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	λ Octantis. Mag. 5.4		ε Pegasi. Mag. 2.5		11 Cephei. Mag. 4.8		δ Capricorni. Mag. 3.0	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 21 37 s	° ' —83 6 "	h m 21 40 s	° ' + 9 28 "	h m 21 40 s	° ' +70 54 "	h m 21 42 s	° ' —16 30 "
Jan. 1.1	57.49	55.4	0.17	64.9	36.93	83.6	20.81	55.5
11.1	56.74 <sup>75</sup>	52.4 <sup>30</sup>	0.14 <sup>3</sup>	63.7 <sup>12</sup>	36.53 <sup>40</sup>	81.2 <sup>24</sup>	20.79 <sup>2</sup>	55.5 <sup>0</sup>
21.1	56.28 <sup>46</sup>	49.0 <sup>34</sup>	0.14 <sup>0</sup>	62.4 <sup>13</sup>	36.22 <sup>31</sup>	78.5 <sup>27</sup>	20.80 <sup>1</sup>	55.3 <sup>2</sup>
31.0	56.13 <sup>15</sup>	45.4 <sup>36</sup>	0.17 <sup>3</sup>	61.2 <sup>12</sup>	36.02 <sup>20</sup>	75.5 <sup>30</sup>	20.84 <sup>4</sup>	55.1 <sup>2</sup>
Feb. 10.0	56.28 <sup>15</sup> 44	41.7 <sup>37</sup> 37	0.23 <sup>6</sup> 9	60.1 <sup>11</sup> 11	35.94 <sup>8</sup> 4	72.3 <sup>32</sup> 32	20.91 <sup>7</sup> 10	54.7 <sup>4</sup> 6
20.0	56.72	38.0	0.32	59.0	35.98	69.1	21.01	54.1
Mar. 2.0	57.45 <sup>73</sup>	34.3 <sup>37</sup>	0.44 <sup>12</sup>	58.2 <sup>8</sup>	36.15 <sup>17</sup>	66.0 <sup>31</sup>	21.15 <sup>14</sup>	53.3 <sup>8</sup>
11.9	58.44 <sup>99</sup>	30.8 <sup>35</sup>	0.60 <sup>16</sup>	57.7 <sup>5</sup>	36.43 <sup>28</sup>	63.1 <sup>29</sup>	21.31 <sup>16</sup>	52.3 <sup>10</sup>
21.9	59.67 <sup>123</sup>	27.4 <sup>34</sup>	0.78 <sup>18</sup>	57.5 <sup>2</sup>	36.83 <sup>40</sup>	60.6 <sup>25</sup>	21.51 <sup>20</sup>	51.2 <sup>11</sup>
31.9	61.12 <sup>145</sup> 163	24.3 <sup>31</sup> 27	1.00 <sup>22</sup> 25	57.6 <sup>1</sup> 4	37.32 <sup>49</sup> 58	58.5 <sup>21</sup> 16	21.74 <sup>23</sup> 25	49.9 <sup>13</sup> 14
Apr. 10.9	62.75	21.6	1.25	58.0	37.90	56.9	21.99	48.5
20.8	64.53 <sup>178</sup>	19.3 <sup>23</sup>	1.52 <sup>27</sup>	58.8 <sup>8</sup>	38.55 <sup>65</sup>	56.0 <sup>9</sup>	22.27 <sup>28</sup>	46.9 <sup>16</sup>
30.8	66.42 <sup>189</sup>	17.4 <sup>19</sup>	1.81 <sup>29</sup>	60.0 <sup>12</sup>	39.25 <sup>70</sup>	55.6 <sup>4</sup>	22.57 <sup>30</sup>	45.2 <sup>17</sup>
May 10.8	68.39 <sup>197</sup>	16.0 <sup>14</sup>	2.12 <sup>31</sup>	61.4 <sup>14</sup>	39.97 <sup>72</sup>	55.8 <sup>2</sup>	22.89 <sup>32</sup>	43.4 <sup>18</sup>
20.7	70.39 <sup>200</sup> 200	15.1 <sup>9</sup> 4	2.44 <sup>32</sup> 31	63.1 <sup>17</sup> 20	40.69 <sup>72</sup> 70	56.7 <sup>9</sup> 14	23.22 <sup>33</sup> 33	41.7 <sup>17</sup> 18
30.7	72.39	14.7	2.75	65.1	41.39	58.1	23.55	39.9
June 9.7	74.34 <sup>195</sup>	14.8 <sup>1</sup>	3.06 <sup>31</sup>	67.2 <sup>21</sup>	42.06 <sup>67</sup>	60.1 <sup>20</sup>	23.88 <sup>33</sup>	38.2 <sup>17</sup>
19.7	76.18 <sup>184</sup>	15.5 <sup>7</sup>	3.36 <sup>30</sup>	69.4 <sup>22</sup>	42.68 <sup>62</sup>	62.6 <sup>25</sup>	24.19 <sup>31</sup>	36.7 <sup>15</sup>
29.6	77.87 <sup>169</sup>	16.6 <sup>11</sup>	3.64 <sup>28</sup>	71.7 <sup>23</sup>	43.22 <sup>54</sup>	65.5 <sup>29</sup>	24.49 <sup>30</sup>	35.3 <sup>14</sup>
July 9.6	79.38 <sup>151</sup> 127	18.2 <sup>16</sup> 20	3.89 <sup>25</sup> 21	74.0 <sup>23</sup> 22	43.67 <sup>45</sup> 36	68.7 <sup>32</sup> 35	24.76 <sup>27</sup> 23	34.1 <sup>12</sup> 10
19.6	80.65	20.2	4.10	76.2	44.03	72.2	24.99	33.1
29.6	81.65 <sup>100</sup>	22.5 <sup>23</sup>	4.28 <sup>18</sup>	78.3 <sup>21</sup>	44.29 <sup>26</sup>	75.8 <sup>36</sup>	25.18 <sup>19</sup>	32.4 <sup>7</sup>
Aug. 8.5	82.35 <sup>70</sup>	25.1 <sup>26</sup>	4.41 <sup>13</sup>	80.3 <sup>20</sup>	44.43 <sup>14</sup>	79.6 <sup>38</sup>	25.33 <sup>15</sup>	31.9 <sup>5</sup>
18.5	82.72 <sup>37</sup>	27.9 <sup>28</sup>	4.50 <sup>9</sup>	82.1 <sup>18</sup>	44.47 <sup>4</sup>	83.4 <sup>38</sup>	25.44 <sup>11</sup>	31.6 <sup>3</sup>
28.5	82.76 <sup>4</sup> 29	30.8 <sup>29</sup> 28	4.55 <sup>5</sup> 0	83.7 <sup>16</sup> 13	44.39 <sup>8</sup> 18	87.2 <sup>38</sup> 36	25.50 <sup>6</sup> 2	31.5 <sup>1</sup> 2
Sept. 7.4	82.47	33.6	4.55	85.0	44.21	90.8	25.52	31.7
17.4	81.85 <sup>62</sup>	36.3 <sup>27</sup>	4.51 <sup>4</sup>	86.1 <sup>11</sup>	43.93 <sup>28</sup>	94.2 <sup>34</sup>	25.49 <sup>3</sup>	32.0 <sup>3</sup>
27.4	80.93 <sup>92</sup>	38.8 <sup>25</sup>	4.44 <sup>7</sup>	87.0 <sup>9</sup>	43.56 <sup>37</sup>	97.3 <sup>31</sup>	25.42 <sup>7</sup>	32.4 <sup>4</sup>
Oct. 7.4	79.74 <sup>119</sup>	40.9 <sup>21</sup>	4.34 <sup>10</sup>	87.6 <sup>6</sup>	43.11 <sup>45</sup>	100.0 <sup>27</sup>	25.33 <sup>9</sup>	32.9 <sup>5</sup>
17.3	78.34 <sup>140</sup> 157	42.6 <sup>17</sup> 12	4.23 <sup>11</sup> 13	88.0 <sup>4</sup> 2	42.60 <sup>51</sup> 57	102.4 <sup>24</sup> 19	25.21 <sup>12</sup> 14	33.5 <sup>6</sup> 6
27.3	76.77	43.8	4.10	88.2	42.03	104.3	25.07	34.1
Nov. 6.3	75.10 <sup>167</sup>	44.4 <sup>6</sup>	3.96 <sup>14</sup>	88.1 <sup>1</sup>	41.43 <sup>60</sup>	105.7 <sup>14</sup>	24.93 <sup>14</sup>	34.7 <sup>6</sup>
16.3	73.40 <sup>170</sup>	44.4 <sup>0</sup>	3.82 <sup>14</sup>	87.8 <sup>3</sup>	40.81 <sup>62</sup>	106.5 <sup>8</sup>	24.80 <sup>13</sup>	35.3 <sup>6</sup>
26.2	71.74 <sup>166</sup>	43.7 <sup>7</sup>	3.70 <sup>12</sup>	87.2 <sup>6</sup>	40.19 <sup>62</sup>	106.7 <sup>2</sup>	24.67 <sup>13</sup>	35.7 <sup>4</sup>
Dec. 6.2	70.18 <sup>156</sup> 140	42.5 <sup>12</sup> 19	3.59 <sup>11</sup> 10	86.5 <sup>7</sup> 9	39.58 <sup>61</sup> 57	106.3 <sup>4</sup> 9	24.56 <sup>11</sup> 9	36.1 <sup>4</sup> 3
16.2	68.78	40.6	3.49	85.6	39.01	105.4	24.47	36.4
26.1	67.59 <sup>119</sup>	38.3 <sup>23</sup>	3.42 <sup>7</sup>	84.6 <sup>10</sup>	38.49 <sup>52</sup>	103.8 <sup>16</sup>	24.40 <sup>7</sup>	36.6 <sup>2</sup>
36.1	66.65 <sup>94</sup>	35.5 <sup>28</sup>	3.37 <sup>5</sup>	83.4 <sup>12</sup>	38.04 <sup>45</sup>	101.8 <sup>20</sup>	24.37 <sup>3</sup>	36.7 <sup>1</sup>
Δ, Tan δ in Place	8.336 60°.495	—8.275 39''.62	1.014 0°.661	+0.167 65''.14	3.059 40°.840	+2.891 71''.41	1.043 21°.070	—0.297 48''.75
α, D <sub>α</sub> α	+0.13	+0.45	0.00	—0.01	—0.04	—0.16	0.00	+0.02
δ, D <sub>δ</sub> δ	+0.3	—0.6	+0.3	—0.6	+0.3	—0.6	+0.3	—0.6



## FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\pi^2$ Cygni. Mag. 4.3		$\mu$ Capricorni. Mag. 5.2		$\gamma$ Grains. Mag. 3.2		16 Pegasi. Mag. 5.0	
	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m	° ' "	h m	° ' "	h m	° ' "	h m	° ' "
	21 43	+48 54	21 48	-13 56	21 48	-37 45	21 49	+253
Jan. 1.1	37.62	66.3	39.55	75.1	46.96	66.1	10.91	33.8
11.1	37.49 <sup>13</sup>	64.1 <sup>22</sup>	39.52 <sup>3</sup>	75.2 <sup>1</sup>	46.92 <sup>4</sup>	65.1 <sup>10</sup>	10.85 <sup>6</sup>	32.0 <sup>1</sup>
21.1	37.40 <sup>9</sup>	61.5 <sup>26</sup>	39.53 <sup>1</sup>	75.2 <sup>0</sup>	46.91 <sup>1</sup>	63.8 <sup>13</sup>	10.83 <sup>2</sup>	30.1 <sup>1</sup>
31.0	37.36 <sup>4</sup>	58.7 <sup>28</sup>	39.56 <sup>3</sup>	75.1 <sup>1</sup>	46.94 <sup>3</sup>	62.2 <sup>16</sup>	10.83 <sup>0</sup>	28.1 <sup>1</sup>
Feb. 10.0	37.37 <sup>1</sup>	55.9 <sup>28</sup>	39.62 <sup>6</sup>	74.8 <sup>3</sup>	47.01 <sup>7</sup>	60.5 <sup>17</sup>	10.87 <sup>4</sup>	26.2 <sup>1</sup>
20.0	37.43 <sup>6</sup>	53.1 <sup>28</sup>	39.72 <sup>10</sup>	74.3 <sup>5</sup>	47.12 <sup>11</sup>	58.6 <sup>19</sup>	10.95 <sup>8</sup>	24.4
Mar. 2.0	37.55 <sup>12</sup>	50.5 <sup>26</sup>	39.84 <sup>12</sup>	73.7 <sup>6</sup>	47.27 <sup>15</sup>	56.6 <sup>20</sup>	11.06 <sup>11</sup>	22.7
11.9	37.73 <sup>18</sup>	48.1 <sup>24</sup>	40.00 <sup>16</sup>	72.9 <sup>8</sup>	47.46 <sup>19</sup>	54.5 <sup>21</sup>	11.21 <sup>15</sup>	21.3
21.9	37.96 <sup>23</sup>	46.1 <sup>20</sup>	40.19 <sup>19</sup>	71.9 <sup>10</sup>	47.68 <sup>22</sup>	52.3 <sup>22</sup>	11.39 <sup>18</sup>	20.3
31.9	38.24 <sup>28</sup>	44.6 <sup>15</sup>	40.41 <sup>22</sup>	70.7 <sup>12</sup>	47.94 <sup>26</sup>	50.1 <sup>22</sup>	11.61 <sup>22</sup>	19.6
Apr. 10.9	38.57 <sup>33</sup>	43.5 <sup>11</sup>	40.66 <sup>25</sup>	69.3 <sup>14</sup>	48.23 <sup>29</sup>	47.9 <sup>22</sup>	11.87 <sup>26</sup>	19.4
20.8	38.93 <sup>36</sup>	43.0 <sup>5</sup>	40.93 <sup>27</sup>	67.7 <sup>16</sup>	48.55 <sup>32</sup>	45.7 <sup>22</sup>	12.15 <sup>28</sup>	19.6
30.8	39.32 <sup>39</sup>	43.1 <sup>1</sup>	41.23 <sup>30</sup>	66.0 <sup>17</sup>	48.89 <sup>34</sup>	43.6 <sup>21</sup>	12.45 <sup>30</sup>	20.3
May 10.8	39.72 <sup>40</sup>	43.8 <sup>7</sup>	41.54 <sup>31</sup>	64.3 <sup>17</sup>	49.26 <sup>37</sup>	41.7 <sup>19</sup>	12.78 <sup>33</sup>	21.4
20.7	40.13 <sup>41</sup>	45.0 <sup>12</sup>	41.86 <sup>32</sup>	62.5 <sup>18</sup>	49.64 <sup>38</sup>	40.0 <sup>17</sup>	13.11 <sup>33</sup>	23.0
30.7	40.54 <sup>41</sup>	46.8 <sup>18</sup>	42.19 <sup>33</sup>	60.7 <sup>18</sup>	50.03 <sup>39</sup>	38.5 <sup>15</sup>	13.44 <sup>33</sup>	
June 9.7	40.94 <sup>40</sup>	49.0 <sup>22</sup>	42.52 <sup>33</sup>	58.9 <sup>18</sup>	50.41 <sup>38</sup>	37.3 <sup>12</sup>	13.77 <sup>33</sup>	
19.7	41.31 <sup>37</sup>	51.6 <sup>26</sup>	42.83 <sup>31</sup>	57.2 <sup>17</sup>	50.78 <sup>37</sup>	36.4 <sup>9</sup>	14.08 <sup>31</sup>	
29.6	41.65 <sup>34</sup>	54.6 <sup>30</sup>	43.13 <sup>30</sup>	55.7 <sup>15</sup>	51.13 <sup>35</sup>	35.8 <sup>6</sup>	14.37 <sup>29</sup>	
July 9.6	41.94 <sup>29</sup>	57.8 <sup>32</sup>	43.39 <sup>26</sup>	54.4 <sup>13</sup>	51.44 <sup>31</sup>	35.5 <sup>3</sup>	14.63 <sup>26</sup>	22.1
19.6	42.19 <sup>25</sup>	61.1 <sup>33</sup>	43.63 <sup>24</sup>	53.2 <sup>12</sup>	51.72 <sup>28</sup>	35.6 <sup>1</sup>	14.85 <sup>23</sup>	37.8
29.6	42.38 <sup>19</sup>	64.6 <sup>35</sup>	43.83 <sup>20</sup>	52.3 <sup>9</sup>	51.95 <sup>23</sup>	36.0 <sup>4</sup>	15.04 <sup>19</sup>	40.6
Aug. 8.5	42.51 <sup>13</sup>	68.1 <sup>35</sup>	43.98 <sup>15</sup>	51.6 <sup>7</sup>	52.14 <sup>19</sup>	36.7 <sup>7</sup>	15.18 <sup>14</sup>	43.3
18.5	42.58 <sup>7</sup>	71.6 <sup>35</sup>	44.10 <sup>12</sup>	51.2 <sup>4</sup>	52.27 <sup>13</sup>	37.6 <sup>9</sup>	15.27 <sup>9</sup>	46.0
28.5	42.59 <sup>1</sup>	74.9 <sup>33</sup>	44.16 <sup>6</sup>	51.0 <sup>2</sup>	52.34 <sup>7</sup>	38.7 <sup>11</sup>	15.31 <sup>4</sup>	48.4
Sept. 7.4	42.55 <sup>4</sup>	78.0 <sup>31</sup>	44.18 <sup>2</sup>	51.0 <sup>0</sup>	52.36 <sup>2</sup>	40.0 <sup>13</sup>	15.32 <sup>1</sup>	50.6
17.4	42.45 <sup>10</sup>	80.9 <sup>29</sup>	44.16 <sup>2</sup>	51.1 <sup>1</sup>	52.32 <sup>4</sup>	41.4 <sup>14</sup>	15.27 <sup>5</sup>	52.6
27.4	42.31 <sup>14</sup>	83.5 <sup>26</sup>	44.10 <sup>6</sup>	51.4 <sup>3</sup>	52.24 <sup>8</sup>	42.8 <sup>14</sup>	15.20 <sup>7</sup>	54.3
Oct. 7.4	42.13 <sup>18</sup>	85.8 <sup>23</sup>	44.01 <sup>9</sup>	51.8 <sup>4</sup>	52.12 <sup>12</sup>	44.2 <sup>14</sup>	15.09 <sup>11</sup>	55.6
17.3	41.91 <sup>22</sup>	87.6 <sup>18</sup>	43.90 <sup>11</sup>	52.3 <sup>5</sup>	51.96 <sup>16</sup>	45.4 <sup>12</sup>	14.96 <sup>13</sup>	56.7
27.3	41.67 <sup>24</sup>	89.0 <sup>14</sup>	43.77 <sup>13</sup>	52.9 <sup>6</sup>	51.79 <sup>17</sup>	46.5 <sup>11</sup>	14.81 <sup>15</sup>	57.4
Nov. 6.3	41.42 <sup>25</sup>	89.9 <sup>9</sup>	43.63 <sup>14</sup>	53.4 <sup>5</sup>	51.61 <sup>18</sup>	47.4 <sup>9</sup>	14.65 <sup>16</sup>	57.7
16.3	41.16 <sup>26</sup>	90.3 <sup>4</sup>	43.50 <sup>13</sup>	54.0 <sup>6</sup>	51.43 <sup>18</sup>	48.0 <sup>6</sup>	14.50 <sup>15</sup>	57.7
26.2	40.91 <sup>25</sup>	90.1 <sup>2</sup>	43.37 <sup>13</sup>	54.5 <sup>5</sup>	51.26 <sup>17</sup>	48.3 <sup>3</sup>	14.35 <sup>15</sup>	57.3
Dec. 6.2	40.67 <sup>24</sup>	89.5 <sup>6</sup>	43.26 <sup>11</sup>	54.9 <sup>4</sup>	51.10 <sup>16</sup>	48.3 <sup>0</sup>	14.21 <sup>14</sup>	56.6
16.2	40.45 <sup>22</sup>	88.3 <sup>12</sup>	43.17 <sup>9</sup>	55.3 <sup>4</sup>	50.97 <sup>13</sup>	48.0 <sup>3</sup>	14.08 <sup>13</sup>	55.5
26.1	40.26 <sup>19</sup>	86.7 <sup>16</sup>	43.10 <sup>7</sup>	55.6 <sup>3</sup>	50.87 <sup>10</sup>	47.3 <sup>7</sup>	13.98 <sup>10</sup>	54.1
36.1	40.10 <sup>16</sup>	84.6 <sup>21</sup>	43.06 <sup>4</sup>	55.8 <sup>2</sup>	50.81 <sup>6</sup>	46.4 <sup>9</sup>	13.90 <sup>8</sup>	52.5
Sec $\delta$ , Tan $\delta$	1.522	+1.147	1.030	-0.248	1.265	-0.775	1.108	+0.41
Mean Place	39° 110	57° 23	39° 795	69° 12	47° 133	54° 84	11° 625	29° 4
D $\phi$ $\alpha$ , D $\omega$ $\alpha$	-0.02	-0.06	0.00	+0.01	+0.01	+0.04	-0.01	-0.01
D $\phi$ $\delta$ , D $\omega$ $\delta$	+0.3	-0.6	+0.3	-0.5	+0.3	-0.5	+0.3	-0.5

**FOR THE UPPER TRANSIT AT WASHINGTON.**

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♑ Aquarii Mag. 4.4		♒ Cephei. Mag. 5.4		♓ Grui. Mag. 2.2		♊ Pegasi. Mag. 4.0	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 22 1 s	° ' " — 14 16 "	h m 22 2 s	° ' " + 62 22 "	h m 22 2 s	° ' " — 47 22 "	h m 22 3 s	° ' " + 24 55 "
Jan. 1.1	50.69	62.9	23.15	27.1	52.79	37.2	2.56	51.2
11.1	50.66 3	63.0 1	22.88 27	25.0 21	52.71 8	35.7 15	2.50 6	49.5 17
21.1	50.65 1	63.0 0	22.67 21	22.4 26	52.67 4	33.9 18	2.46 4	47.7 18
31.1	50.67 2	62.9 1	22.53 14	19.6 28	52.67 0	31.9 20	2.45 1	45.8 19
Feb. 10.0	50.72 5 8	62.6 3 5	22.46 7 1	16.6 30 31	52.72 5 10	29.6 23 24	2.47 2 6	44.0 18 18
20.0	50.80	62.1	22.47	13.5	52.82	27.2	2.53	42.2
Mar. 2.0	50.91 11	61.4 7	22.57 10	10.5 30	52.96 14	24.6 26	2.63 10	40.6 16
11.9	51.06 15	60.5 9	22.75 18	7.7 28	53.15 19	22.0 26	2.76 13	39.2 14
21.9	51.23 17	59.4 11	23.01 26	5.2 25	53.38 23	19.3 27	2.94 18	38.1 11
31.9	51.44 21 23	58.2 12 15	23.35 34 40	3.2 20 16	53.65 27 31	16.7 26 26	3.15 21 24	37.5 6 3
Apr. 10.9	51.67	56.7	23.75	1.6	53.96	14.1	3.39	37.2
20.8	51.94 27	55.1 16	24.21 46	0.5 11	54.31 35	11.7 24	3.67 28	37.4 1
30.8	52.23 29	53.4 17	24.71 50	0.1 4	54.69 38	9.4 23	3.97 30	38.0 6
May 10.8	52.54 31	51.6 18	25.24 53	0.3 2	55.10 41	7.4 20	4.29 32	39.1 11
20.8	52.86 32 32	49.7 19 18	25.79 55 54	1.0 7 14	55.52 42 44	5.6 18 15	4.62 33 33	40.6 15 18
30.7	53.18	47.9	26.33	2.4	55.96	4.1	4.95	42.4
June 9.7	53.51 33	46.1 18	26.86 53	4.3 19	56.39 43	3.0 11	5.28 33	44.6 22
19.7	53.83 32	44.4 17	27.35 49	6.6 23	56.81 42	2.3 7	5.60 32	47.0 24
29.6	54.13 30	42.8 16	27.80 45	9.4 28	57.20 39	1.9 4	5.90 30	49.6 26
July 9.6	54.41 28 25	41.4 14 12	28.20 40 33	12.5 31 34	57.57 37 33	2.0 1 4	6.17 27 24	52.3 27 28
19.6	54.66	40.2	28.53	15.9	57.90	2.4	6.41	55.1
29.6	54.86 20	39.3 9	28.79 26	19.5 36	58.17 27	3.2 8	6.61 20	57.8 27
Aug. 8.5	55.03 17	38.6 7	28.97 18	23.2 37	58.39 22	4.3 11	6.76 15	60.5 27
18.5	55.16 13	38.1 5	29.07 10	26.9 37	58.55 16	5.7 14	6.87 11	63.1 26
28.5	55.23 7 3	37.9 2 0	29.09 2 5	30.6 37 36	58.64 9 3	7.3 16 18	6.93 6 2	65.6 25 28
Sept. 7.5	55.26	37.9	29.04	34.2	58.67	9.1	6.95	67.8
17.4	55.25 1	38.1 2	28.91 13	37.6 34	58.64 3	11.0 19	6.92 3	69.8 20
27.4	55.21 4	38.4 3	28.71 20	40.7 31	58.56 8	12.8 18	6.86 6	71.5 17
Oct. 7.4	55.13 8	38.9 5	28.46 25	43.5 28	58.42 14	14.5 17	6.77 9	72.9 24
17.3	55.02 11 12	39.4 5 6	28.16 30 35	45.9 24 19	58.25 17 20	16.1 16 14	6.65 12 14	74.0 11 7
27.3	54.90	40.0	27.81	47.8	58.05	17.5	6.51	74.7
Nov. 6.3	54.77 13	40.6 6	27.44 37	49.3 15	57.83 22	18.6 11	6.37 14	75.1 4
16.3	54.64 13	41.2 6	27.05 39	50.2 9	57.60 23	19.3 7	6.22 15	75.2 1
26.2	54.51 13	41.8 6	26.65 40	50.6 4	57.38 22	19.6 3	6.07 15	74.9 3
Dec. 6.2	54.40 11 10	42.2 4 4	26.26 39 38	50.4 2 8	57.18 20 18	19.5 1 5	5.93 14 12	74.3 6 10
16.2	54.30	42.6	25.88	49.6	57.00	19.0	5.81	73.3
26.2	54.23 7	42.9 3	25.54 34	48.2 14	56.86 14	18.1 9	5.70 11	72.0 15
36.1	54.17 6	43.1 2	25.24 30	46.4 18	56.75 11	16.9 12	5.62 8	70.5 15
Sec δ, Tan δ	1.032	—0.255	2.157	+1.911	1.477	—1.086	1.103	+0.465
Mean Place	50°.877	57''.16	25°.475	14''.15	52°.890	24''.06	3°.194	46''.17
D'ψ α, Dω α	0.00	+0.01	—0.02	—0.11	+0.01	+0.06	—0.01	—0.03
Dψ δ, Dω δ	+0.3	—0.5	+0.3	—0.5	+0.3	—0.5	+0.3	—0.5

FOR THE UPPER TRANSIT AT WASHINGTON.



FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	3 Lacertæ. Mag. 4.6		π Aquarii. Mag. 4.6		σ Aquarii. Mag. 4.9		α Lacertæ. Mag. 3.8	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.
	h m 22 20 s	° ' + 51 47 "	h m 22 20 s	° ' + 0 56 "	h m 22 26 s	° ' - 11 6 "	h m 22 27 s	° ' + 49 50 "
m. 1.2	11.55	82.9	55.95	43.3	8.95	51.9	46.04	55.2
11.1	11.36 <sup>19</sup>	81.0 <sup>19</sup>	55.90 <sup>5</sup>	42.6 <sup>7</sup>	8.90 <sup>5</sup>	52.2 <sup>3</sup>	45.86 <sup>18</sup>	53.4 <sup>18</sup>
21.1	11.22 <sup>14</sup>	78.7 <sup>23</sup>	55.87 <sup>3</sup>	41.8 <sup>8</sup>	8.87 <sup>3</sup>	52.3 <sup>1</sup>	45.72 <sup>14</sup>	51.1 <sup>23</sup>
31.1	11.12 <sup>10</sup>	76.1 <sup>26</sup>	55.87 <sup>0</sup>	41.2 <sup>6</sup>	8.86 <sup>1</sup>	52.3 <sup>0</sup>	45.62 <sup>10</sup>	48.6 <sup>25</sup>
b. 10.0	11.07 <sup>5</sup> <sup>1</sup>	73.3 <sup>28</sup> <sup>28</sup>	55.89 <sup>2</sup> <sup>6</sup>	40.6 <sup>6</sup> <sup>4</sup>	8.89 <sup>3</sup> <sup>5</sup>	52.2 <sup>1</sup> <sup>3</sup>	45.57 <sup>5</sup> <sup>0</sup>	45.9 <sup>27</sup> <sup>27</sup>
20.0	11.08	70.5	55.95	40.2	8.94	51.9	45.57	43.2
ar. 2.0	11.15 <sup>7</sup>	67.8 <sup>27</sup>	56.03 <sup>8</sup>	39.9 <sup>3</sup>	9.02 <sup>8</sup>	51.4 <sup>5</sup>	45.63 <sup>6</sup>	40.6 <sup>26</sup>
12.0	11.28 <sup>13</sup>	65.2 <sup>26</sup>	56.15 <sup>12</sup>	39.9 <sup>0</sup>	9.14 <sup>12</sup>	50.6 <sup>8</sup>	45.75 <sup>12</sup>	38.1 <sup>25</sup>
21.9	11.46 <sup>18</sup>	63.0 <sup>22</sup>	56.30 <sup>15</sup>	40.2 <sup>3</sup>	9.29 <sup>15</sup>	49.7 <sup>9</sup>	45.93 <sup>18</sup>	35.9 <sup>22</sup>
31.9	11.71 <sup>25</sup> <sup>31</sup>	61.1 <sup>19</sup> <sup>14</sup>	56.48 <sup>18</sup> <sup>22</sup>	40.7 <sup>5</sup> <sup>8</sup>	9.47 <sup>18</sup> <sup>22</sup>	48.5 <sup>12</sup> <sup>14</sup>	46.16 <sup>23</sup> <sup>29</sup>	34.1 <sup>18</sup> <sup>14</sup>
r. 10.9	12.02	59.7	56.70	41.5	9.69	47.1	46.45	32.7
20.9	12.37 <sup>35</sup>	58.8 <sup>9</sup>	56.95 <sup>25</sup>	42.6 <sup>11</sup>	9.94 <sup>25</sup>	45.6 <sup>15</sup>	46.78 <sup>33</sup>	31.8 <sup>9</sup>
30.8	12.75 <sup>38</sup>	58.5 <sup>3</sup>	57.22 <sup>27</sup>	44.0 <sup>14</sup>	10.21 <sup>27</sup>	43.8 <sup>18</sup>	47.15 <sup>37</sup>	31.4 <sup>4</sup>
y 10.8	13.17 <sup>42</sup>	58.7 <sup>2</sup>	57.51 <sup>29</sup>	45.5 <sup>15</sup>	10.51 <sup>30</sup>	42.0 <sup>18</sup>	47.55 <sup>40</sup>	31.6 <sup>2</sup>
20.8	13.60 <sup>43</sup> <sup>44</sup>	59.5 <sup>8</sup> <sup>13</sup>	57.82 <sup>31</sup> <sup>32</sup>	47.3 <sup>18</sup> <sup>19</sup>	10.82 <sup>31</sup> <sup>32</sup>	40.1 <sup>19</sup> <sup>20</sup>	47.97 <sup>42</sup> <sup>43</sup>	32.4 <sup>8</sup> <sup>13</sup>
30.7	14.04	60.8	58.14	49.2	11.14	38.1	48.40	33.7
ne 9.7	14.48 <sup>44</sup>	62.6 <sup>18</sup>	58.46 <sup>32</sup>	51.2 <sup>20</sup>	11.47 <sup>33</sup>	36.2 <sup>19</sup>	48.82 <sup>42</sup>	35.5 <sup>18</sup>
19.7	14.89 <sup>41</sup>	64.9 <sup>23</sup>	58.77 <sup>31</sup>	53.3 <sup>21</sup>	11.79 <sup>32</sup>	34.3 <sup>19</sup>	49.23 <sup>41</sup>	37.7 <sup>22</sup>
29.7	15.28 <sup>39</sup>	67.6 <sup>27</sup>	59.07 <sup>30</sup>	55.4 <sup>21</sup>	12.10 <sup>31</sup>	32.6 <sup>17</sup>	49.61 <sup>38</sup>	40.3 <sup>26</sup>
ly 9.6	15.63 <sup>35</sup> <sup>30</sup>	70.6 <sup>30</sup> <sup>32</sup>	59.34 <sup>27</sup> <sup>25</sup>	57.4 <sup>20</sup> <sup>19</sup>	12.38 <sup>28</sup> <sup>26</sup>	31.0 <sup>16</sup> <sup>14</sup>	49.96 <sup>35</sup> <sup>31</sup>	43.3 <sup>30</sup> <sup>32</sup>
19.6	15.93	73.8	59.59	59.3	12.64	29.6	50.27	46.5
29.6	16.18 <sup>25</sup>	77.3 <sup>35</sup>	59.80 <sup>21</sup>	61.0 <sup>17</sup>	12.86 <sup>22</sup>	28.4 <sup>12</sup>	50.52 <sup>25</sup>	49.8 <sup>33</sup>
g. 8.6	16.38 <sup>20</sup>	80.8 <sup>35</sup>	59.98 <sup>18</sup>	62.6 <sup>16</sup>	13.05 <sup>19</sup>	27.4 <sup>10</sup>	50.72 <sup>20</sup>	53.3 <sup>35</sup>
18.5	16.51 <sup>13</sup>	84.3 <sup>35</sup>	60.11 <sup>13</sup>	64.0 <sup>14</sup>	13.20 <sup>15</sup>	26.7 <sup>7</sup>	50.87 <sup>15</sup>	56.8 <sup>35</sup>
28.5	16.58 <sup>7</sup> <sup>1</sup>	87.7 <sup>34</sup> <sup>34</sup>	60.20 <sup>9</sup> <sup>5</sup>	65.2 <sup>12</sup> <sup>9</sup>	13.30 <sup>10</sup> <sup>5</sup>	26.3 <sup>4</sup> <sup>2</sup>	50.96 <sup>9</sup> <sup>2</sup>	60.2 <sup>34</sup> <sup>33</sup>
ot. 7.5	16.59	91.1	60.25	66.1	13.35	26.1	50.98	63.5
17.4	16.54 <sup>5</sup>	94.3 <sup>32</sup>	60.26 <sup>1</sup>	66.8 <sup>7</sup>	13.36 <sup>1</sup>	26.1 <sup>0</sup>	50.95 <sup>3</sup>	66.6 <sup>31</sup>
27.4	16.44 <sup>10</sup>	97.2 <sup>29</sup>	60.23 <sup>3</sup>	67.3 <sup>5</sup>	13.34 <sup>2</sup>	26.3 <sup>2</sup>	50.87 <sup>8</sup>	69.5 <sup>29</sup>
t. 7.4	16.29 <sup>15</sup>	99.8 <sup>26</sup>	60.17 <sup>6</sup>	67.6 <sup>3</sup>	13.28 <sup>6</sup>	26.6 <sup>3</sup>	50.75 <sup>12</sup>	72.1 <sup>26</sup>
17.4	16.11 <sup>18</sup> <sup>22</sup>	102.0 <sup>22</sup> <sup>18</sup>	60.08 <sup>9</sup> <sup>10</sup>	67.7 <sup>1</sup> <sup>1</sup>	13.19 <sup>9</sup> <sup>10</sup>	27.1 <sup>5</sup> <sup>5</sup>	50.58 <sup>17</sup> <sup>20</sup>	74.3 <sup>22</sup> <sup>18</sup>
27.3	15.89	103.8	59.98	67.6	13.09	27.6	50.38	76.1
v. 6.3	15.65 <sup>24</sup>	105.2 <sup>14</sup>	59.86 <sup>12</sup>	67.3 <sup>3</sup>	12.97 <sup>12</sup>	28.2 <sup>6</sup>	50.16 <sup>22</sup>	77.6 <sup>15</sup>
16.3	15.39 <sup>26</sup>	106.1 <sup>9</sup>	59.74 <sup>12</sup>	66.9 <sup>4</sup>	12.85 <sup>12</sup>	28.8 <sup>6</sup>	49.93 <sup>23</sup>	78.5 <sup>9</sup>
26.3	15.13 <sup>26</sup>	106.4 <sup>3</sup>	59.62 <sup>12</sup>	66.4 <sup>5</sup>	12.73 <sup>12</sup>	29.4 <sup>6</sup>	49.68 <sup>25</sup>	78.9 <sup>4</sup>
c. 6.2	14.87 <sup>26</sup> <sup>25</sup>	106.3 <sup>1</sup> <sup>7</sup>	59.51 <sup>11</sup> <sup>10</sup>	65.8 <sup>6</sup> <sup>6</sup>	12.61 <sup>12</sup> <sup>10</sup>	30.0 <sup>6</sup> <sup>5</sup>	49.44 <sup>24</sup> <sup>23</sup>	78.7 <sup>2</sup> <sup>6</sup>
16.2	14.62	105.6	59.41	65.2	12.51	30.5	49.21	78.1
26.2	14.39 <sup>23</sup>	104.3 <sup>13</sup>	59.32 <sup>9</sup>	64.4 <sup>8</sup>	12.42 <sup>9</sup>	30.9 <sup>4</sup>	48.99 <sup>22</sup>	76.9 <sup>12</sup>
36.1	14.19 <sup>20</sup>	102.6 <sup>17</sup>	59.26 <sup>6</sup>	63.7 <sup>7</sup>	12.36 <sup>6</sup>	31.3 <sup>4</sup>	48.80 <sup>19</sup>	75.4 <sup>15</sup>
l, Tan δ	1.617	+1.271	1.000	+0.017	1.019	-0.196	1.551	+1.185
1 Place	12°.924	70''.39	56°.163	44''.29	9°.036	47''.60	47°.263	42''.51
i, D <sub>α</sub>	-0.01	-0.08	0.00	0.00	0.00	+0.01	-0.01	-0.07
i, D <sub>δ</sub>	+0.4	-0.4	+0.4	-0.4	+0.4	-0.4	+0.4	-0.4

$\frac{1}{2}$

FOR THE UPPER TRANSIT AT WASHINGTON.

an Solar Date.	ε Piscis Australis. Mag. 4.2		ζ Pegasi. Mag. 3.6		β Octantis. Mag. 4.3		β Gruis. Mag. 2.2	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 22 35 s	° ' " -27 28 "	h m 22 37 s	° ' " +10 23 "	h m 22 37 s	° ' " -81 49 "	h m 22 37 s	° ' " -47 19 "
n. 1.2	57.47	83.5	13.11	16.8	25.91	56.7	35.99	59.6
11.1	57.40 7	83.1 4	13.04 7	15.7 II	24.93 98	54.2 25	35.87 12	58.3 13
21.1	57.35 5	82.5 6	13.00 4	14.6 II	24.15 78	51.3 29	35.79 8	56.7 16
31.1	57.34 1	81.6 9	12.98 2	13.5 II	23.59 56	48.0 33	35.74 5	54.8 19
b. 10.1	57.35 1	80.5 II	12.98 0	12.4 II	23.26 33	44.4 36	35.74 0	52.6 22
	4	14	3	9	8	38	4	25
20.0	57.39 8	79.1 15	13.01 7	11.5 8	23.18 15	40.6 38	35.78 8	50.1 26
ar. 2.0	57.47 11	77.6 17	13.08 10	10.7 5	23.33 39	36.8 38	35.86 13	47.5 27
12.0	57.58 15	75.9 19	13.18 13	10.2 3	23.72 61	33.0 38	35.99 18	44.8 29
21.9	57.73 19	74.0 20	13.31 17	9.9 0	24.33 82	29.2 36	36.17 22	41.9 28
31.9	57.92 22	72.0 21	13.48 21	9.9 3	25.15 102	25.6 33	36.39 27	39.1 28
or. 10.9	58.14 26	69.9 22	13.69 23	10.2 7	26.17 119	22.3 30	36.66 31	36.3 28
20.9	58.40 29	67.7 22	13.92 27	10.9 10	27.36 134	19.3 27	36.97 35	33.5 26
30.8	58.69 31	65.5 22	14.19 29	11.9 13	28.70 147	16.6 23	37.32 38	30.9 24
ay 10.8	59.00 33	63.3 21	14.48 31	13.2 16	30.17 156	14.3 18	37.70 40	28.5 21
20.8	59.33 35	61.2 20	14.79 32	14.8 19	31.73 161	12.5 12	38.10 42	26.4 18
30.8	59.68 35	59.2 18	15.11 32	16.7 20	33.34 164	11.3 8	38.52 43	24.6 15
ne 9.7	60.03 35	57.4 16	15.43 32	18.7 22	34.98 162	10.5 2	38.95 43	23.1 12
19.7	60.38 33	55.8 13	15.75 31	20.9 22	36.60 156	10.3 3	39.38 41	21.9 7
29.7	60.71 32	54.5 10	16.06 28	23.1 23	38.16 146	10.6 13	39.79 36	21.2 1
ly 9.6	61.03 29	53.5 7	16.34 26	25.4 23	39.62 131	11.5 18	40.18 30	20.9 6
19.6	61.32 25	52.8 4	16.60 22	27.7 22	40.93 113	12.8 23	40.54 26	21.0 9
29.6	61.57 21	52.4 1	16.82 19	29.9 20	42.06 92	14.6 25	40.84 20.	21.6 13
ig. 8.6	61.78 17	52.3 2	17.01 15	31.9 17	42.98 67	16.9 27	41.10 14	22.5 15
18.5	61.95 12	52.5 5	17.16 10	33.8 15	43.65 41	19.4 29	41.30 8	23.8 18
28.5	62.07 7	53.0 7	17.26 6	35.5 15	44.06 12	22.1 19	41.44 17	25.3 17
pt. 7.5	62.14 2	53.7 10	17.32 2	37.0 13	44.18 17	25.0 30	41.52 1	27.1 19
17.5	62.16 3	54.7 11	17.34 2	38.3 10	44.01 44	28.0 28	41.53 4	29.0 20
27.4	62.13 6	55.8 11	17.32 5	39.3 8	43.57 70	30.8 26	41.49 10	31.0 20
t. 7.4	62.07 9	56.9 12	17.27 7	40.1 6	42.87 94	33.4 23	41.39 14	33.0 18
17.4	61.98 12	58.1 11	17.20 10	40.7 3	41.93 113	35.7 19	41.25 17	34.8 17
27.3	61.86 13	59.2 11	17.10 11	41.0 0	40.80 129	37.6 14	41.08 20	36.5 14
iv. 6.3	61.73 14	60.3 9	16.99 12	41.0 1	39.51 139	39.0 8	40.88 22	37.9 10
16.3	61.59 15	61.2 7	16.87 12	40.9 3	38.12 143	39.8 2	40.66 21	38.9 7
26.3	61.44 14	61.9 5	16.75 11	40.6 6	36.69 136	40.0 10	40.44 20	39.6 2
x. 6.2	61.30 12	62.4 2	16.64 11	40.0 7	35.26 136	39.6 10	40.23 20	39.8 1
16.2	61.18 11	62.6 0	16.53 10	39.3 9	33.90 126	38.6 17	40.03 15	39.7 6
26.2	61.07 9	62.6 2	16.43 7	38.4 10	32.64 110	36.9 22	39.86 15	39.1 10
36.2	60.98	62.4	16.36	37.4	31.54	34.7	39.71	38.1
δ, Tan δ n Place	1.127 57°.401	-0.520 74''.91	1.017 13°.343	+0.183 14''.19	7.033 26°.383	-6.962 39''.87	1.475 35°.848	-1.085 46''.45
a, D <sub>∞</sub> α	0.00	+0.03	0.00	-0.01	+0.07	+0.44	+0.01	+0.07
b, D <sub>∞</sub> δ	+0.4	-0.4	+0.4	-0.4	+0.4	-0.4	+0.4	-0.4



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	η Pegasi. Mag. 3.1		λ Pegasi. Mag. 4.1		ε Gravis. Mag. 3.7		τ Aquarii. Mag. 4.2	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 22 39 s	° ' " +29 46 "	h m 22 42 s	° ' " +23 6 "	h m 22 43 s	° ' " -51 45 "	h m 22 45 s	° ' " -14 2 "
Jan. 1.2	0.42	42.9	25.72	71.6	25.75	64.5	5.63	34.0
11.1	0.32 10	41.4 15	25.64 8	70.3 13	25.60 15	63.1 14	5.57 6	34.2 2
21.1	0.24 8	39.7 17	25.57 7	68.8 15	25.50 10	61.3 18	5.52 5	34.2 0
31.1	0.19 5	37.8 19	25.53 4	67.1 17	25.43 7	59.1 22	5.50 2	34.0 2
Feb. 10.1	0.17 2	35.8 20	25.52 1	65.5 16	25.41 2	56.7 24	5.51 1	33.7 3
		19	2	16	2	26	3	5
20.0	0.19 6	33.9 19	25.54 5	63.9 15	25.43 8	54.1 28	5.54 6	33.2 7
Mar. 2.0	0.25 9	32.0 16	25.59 10	62.4 13	25.51 13	51.3 30	5.60 10	32.5 10
12.0	0.34 14	30.4 13	25.69 13	61.1 10	25.64 17	48.3 30	5.70 13	31.5 11
21.9	0.48 18	29.1 11	25.82 17	60.1 7	25.81 23	45.3 31	5.83 17	30.4 13
31.9	0.66 22	28.0 6	25.99 21	59.4 3	26.04 28	42.2 29	6.00 20	29.1 16
Apr. 10.9	0.88 26	27.4 2	26.20 24	59.1 1	26.32 32	39.3 29	6.20 23	27.5 17
20.9	1.14 29	27.2 3	26.44 28	59.2 5	26.64 37	36.4 27	6.43 26	25.8 19
30.8	1.43 32	27.5 7	26.72 30	59.7 9	27.01 40	33.7 25	6.69 29	23.9 19
May 10.8	1.75 34	28.2 12	27.02 32	60.6 13	27.41 43	31.2 22	6.98 31	22.0 20
20.8	2.09 34	29.4 16	27.34 34	61.9 16	27.84 45	29.0 18	7.29 33	20.0 21
30.8	2.43 35	31.0 19	27.68 34	63.5 20	28.29 46	27.2 15	7.62 33	17.9 20
June 9.7	2.78 34	32.9 22	28.02 33	65.5 22	28.75 46	25.7 11	7.95 32	15.9 19
19.7	3.12 33	35.1 25	28.35 31	67.7 25	29.21 44	24.6 6	8.27 32	14.0 17
29.7	3.45 30	37.6 27	28.66 27	70.2 27	29.65 38	24.0 3	8.59 28	12.3 13
July 9.6	3.75 27	40.3 28	28.96 27	72.7 27	30.07 38	23.8 3	8.89 28	10.7 13
19.6	4.02 24	43.1 29	29.23 23	75.4 26	30.45 34	24.1 7	9.17 24	9.4 11
29.6	4.26 19	46.0 29	29.46 19	78.0 26	30.79 29	24.8 11	9.41 20	8.3 9
Aug. 8.6	4.45 15	48.9 28	29.65 15	80.6 26	31.08 22	25.9 14	9.61 16	7.4 5
18.5	4.60 10	51.7 27	29.80 11	83.2 24	31.30 15	27.3 17	9.77 12	6.9 3
28.5	4.70 5	54.4 25	29.91 6	85.6 21	31.45 9	29.0 20	9.89 7	6.6 1
Sept. 7.5	4.75 2	56.9 23	29.97 2	87.7 20	31.54 2	31.0 21	9.96 4	6.5 2
17.5	4.77 3	59.2 20	29.99 2	89.7 17	31.56 5	33.1 22	10.00 1	6.7 4
27.4	4.74 7	61.2 18	29.97 5	91.4 15	31.51 10	35.3 20	9.99 5	7.1 5
Oct. 7.4	4.67 9	63.0 15	29.92 8	92.9 12	31.41 16	37.5 20	9.94 7	7.6 6
17.4	4.58 12	64.5 11	29.84 10	94.1 8	31.25 20	39.5 17	9.87 9	8.2 7
27.3	4.46 13	65.6 8	29.74 12	94.9 6	31.05 22	41.2 15	9.78 11	8.9 8
Nov. 6.3	4.33 14	66.4 4	29.62 13	95.5 2	30.83 24	42.7 12	9.67 12	9.7 7
16.3	4.19 15	66.8 1	29.49 14	95.7 0	30.59 25	43.9 7	9.55 12	10.4 7
26.3	4.04 15	66.9 3	29.35 13	95.7 4	30.34 24	44.6 2	9.43 12	11.1 6
Dec. 6.2	3.89 14	66.6 7	29.22 13	95.3 7	30.10 23	44.8 2	9.31 11	11.7 5
16.2	3.75 13	65.9 11	29.09 11	94.6 10	29.87 21	44.6 7	9.20 9	12.2 4
26.2	3.62 11	64.8 13	28.98 10	93.6 12	29.66 17	43.9 11	9.11 8	12.6 2
36.2	3.51 11	63.5 13	28.88 10	92.4 12	29.49 17	42.8 11	9.03 8	12.8 2
Sec δ, Tan δ	1.152	+0.572	1.087	+0.427	1.616	-1.269	1.031	-0.250
Mean Place	0°.947	34''.51	26°.109	64''.97	25°.560	50''.53	5°.599	29''.33
D'ψa, Dωa	-0.01	-0.04	0.00	-0.03	+0.01	+0.08	0.00	+0.02
Dψδ, Dωδ	+0.4	-0.3	+0.4	-0.3	+0.4	-0.3	+0.4	-0.3

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\mu$ Pegasi. Mag. 3.7		$\iota$ Cephei. Mag. 3.7		$\lambda$ Aquarii. Mag. 3.8		$\rho$ Indi. Mag. 6.1	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination S.
	h m 22 45 s	° ' + 24 9 "	h m 22 46 s	° ' + 65 45 "	h m 22 48 s	° ' — 8 1 "	h m 22 48 s	° ' — 70 31 "
m. 1.2	53.58	16.1	36.86	28.2	10.85	58.7	45.73	57.7
11.1	53.49 9	14.7 14	36.49 37	26.6 16	10.79 6	59.1 4	45.35 38	55.6 21
21.1	53.42 7	13.2 15	36.17 32	24.5 21	10.74 5	59.4 3	45.05 30	53.1 25
31.1	53.37 5	11.5 17	35.91 26	22.0 25	10.72 2	59.6 2	44.83 22	50.2 29
ab. 10.1	53.36 1	9.8 17	35.73 18	19.2 28	10.72 0	59.6 0	44.71 12	47.1 31
		16	9	30	3	2	3	34
20.0	53.37	8.2	35.64	16.2	10.75	59.4	44.68	43.7
ar. 2.0	53.42 5	6.6 16	35.64 0	13.2 30	10.81 6	59.0 4	44.74 6	40.1 36
12.0	53.51 9	5.3 13	35.74 10	10.3 29	10.90 9	58.5 5	44.91 17	36.4 37
22.0	53.64 13	4.2 11	35.93 19	7.5 28	11.03 13	57.7 8	45.17 26	32.8 36
31.9	53.81 17	3.5 7	36.22 29	5.0 25	11.19 16	56.7 10	45.52 35	29.3 35
	21	4	37	20	19	13	44	34
or. 10.9	54.02	3.1	36.59	3.0	11.38	55.4	45.96	25.9
20.9	54.26 24	3.1 0	37.04 45	1.5 15	11.61 23	53.9 15	46.48 52	22.8 31
30.8	54.54 28	3.6 5	37.56 52	0.5 10	11.87 26	52.2 17	47.07 59	19.9 29
ay 10.8	54.84 30	4.4 8	38.12 56	0.0 5	12.15 28	50.4 18	47.73 66	17.4 25
20.8	55.16 32	5.7 13	38.72 60	0.1 1	12.46 31	48.5 19	48.44 71	15.3 21
	34	16	61	8	32	20	74	17
30.8	55.50	7.3	39.33	0.9	12.78	46.5	49.18	13.6
ne 9.7	55.84 34	9.2 19	39.94 61	2.2 13	13.10 32	44.5 20	49.93 75	12.4 12
19.7	56.17 33	11.5 23	40.53 59	4.0 18	13.42 32	42.5 20	50.68 75	11.8 6
29.7	56.49 32	13.9 24	41.09 56	6.3 23	13.73 31	40.6 19	51.42 74	11.7 1
ly 9.7	56.79 30	16.4 25	41.60 51	9.0 27	14.03 30	38.8 18	52.11 69	12.1 4
	27	27	44	31	27	16	63	9
19.6	57.06	19.1	42.04	12.1	14.30	37.2	52.74	13.0
29.6	57.30 24	21.8 27	42.42 38	15.4 33	14.54 24	35.8 14	53.30 56	14.3 13
ig. 8.6	57.50 20	24.4 26	42.72 30	19.0 36	14.74 20	34.6 12	53.77 47	16.1 18
18.5	57.65 15	27.0 26	42.93 21	22.7 37	14.90 16	33.7 9	54.13 36	18.3 22
28.5	57.76 11	29.4 24	43.06 13	26.5 38	15.02 12	33.1 6	54.37 24	20.7 24
	7	23	5	37	8	4	12	27
pt. 7.5	57.83	31.7	43.11	30.2	15.10	32.7	54.49	23.4
17.5	57.85 2	33.7 20	43.07 4	33.8 36	15.13 3	32.5 2	54.49 0	26.1 27
27.4	57.84 1	35.5 18	42.95 12	37.3 35	15.13 0	32.5 0	54.36 13	28.8 27
t. 7.4	57.79 5	37.0 15	42.76 19	40.5 32	15.09 4	32.7 2	54.13 23	31.5 27
17.4	57.71 8	38.2 12	42.50 26	43.4 29	15.02 7	33.0 3	53.79 34	33.8 23
	10	10	31	25	9	5	42	21
27.4	57.61	39.2	42.19	45.9	14.93	33.5	53.37	35.9
v. 6.3	57.49 12	39.8 6	41.83 36	48.0 21	14.83 10	34.1 6	52.88 49	37.5 16
16.3	57.36 13	40.1 3	41.43 40	49.5 15	14.72 11	34.7 6	52.35 53	38.6 11
26.3	57.22 14	40.0 1	41.00 43	50.5 10	14.60 12	35.3 6	51.80 55	39.1 5
c. 6.2	57.09 13	39.7 3	40.56 44	51.0 5	14.49 11	35.9 6	51.25 55	39.1 0
	13	7	44	2	11	6	53	6
16.2	56.96	39.0	40.12	50.8	14.38	36.5	50.72	38.5
26.2	56.85 11	38.0 10	39.70 42	50.1 7	14.29 9	37.0 5	50.24 48	37.3 12
36.2	56.74 11	36.8 12	39.31 39	48.8 13	14.21 8	37.5 5	49.81 43	35.6 17
$\delta$ , Tan $\delta$	1.096	+0.448	2.435	+2.221	1.010	−0.141	3.000	−2.828
n Place	53°.962	8''.89	39°.052	11''.17	10°.851	55''.91	45°.522	41''.31
$\alpha$ , D $\alpha$ $\alpha$	0.00	−0.03	−0.02	−0.14	0.00	+0.01	+0.02	+0.18
$\delta$ , D $\alpha$ $\delta$	+0.4	−0.3	+0.4	−0.3	+0.4	−0.3	+0.4	−0.3

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\delta$ Aquarii. Mag. 3.5		$\alpha$ Piscis Australis. (Fomalhaut.) Mag. 1.3		$\theta$ Andromedæ. Mag. 3.6.		$\beta$ Pegasi. Var. 2.2-2.7	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 22 50	° ' " -16 16	h m 22 52	° ' " -30 3	h m 22 57	° ' " +41 52	h m 22 59	° ' " +27 37
	s	"	s	"	s	"	s	"
Jan. 1.2	8.51	28.5	57.59	92.1	59.71	20.9	38.74	26.2
11.1	8.44 7	28.6 1	57.50 9	91.6 5	59.56 15	19.4 15	38.63 11	24.9 13
21.1	8.39 5	28.5 1	57.44 6	90.9 7	59.43 13	17.5 19	38.55 8	23.3 16
31.1	8.37 2	28.3 2	57.40 4	89.9 10	59.33 10	15.4 21	38.49 6	21.6 17
Feb. 10.1	8.37 0	27.8 5	57.39 1	88.7 12	59.27 6	13.1 23	38.45 4	19.9 17
	2	6	3	15	2	23	0	18
20.0	8.39	27.2	57.42	87.2	59.25	10.8	38.45	18.1
Mar. 2.0	8.45 6	26.3 9	57.48 6	85.5 17	59.28 3	8.5 23	38.48 3	16.4 17
12.0	8.55 10	25.2 11	57.57 9	83.6 19	59.35 7	6.3 22	38.56 8	14.9 15
22.0	8.67 12	23.9 13	57.70 13	81.6 20	59.47 12	4.3 20	38.67 11	13.6 13
31.9	8.83 16	22.4 15	57.87 17	79.4 22	59.65 18	2.7 16	38.83 16	12.6 10
	20	16	21	23	23	13	20	6
Apr. 10.9	9.03	20.8	58.08	77.1	59.88	1.4 8	39.03	12.0
20.9	9.26 23	19.0 18	58.33 25	74.8 23	60.15 27	0.6 8	39.27 24	11.8 2
30.8	9.52 26	17.0 20	58.61 28	72.4 24	60.46 31	0.3 3	39.54 27	12.1 3
May 10.8	9.81 29	15.0 20	58.91 30	70.1 23	60.81 35	0.4 1	39.84 30	12.8 7
20.8	10.12 31	12.9 21	59.24 33	67.9 22	61.18 37	1.1 7	40.17 33	13.9 11
	33	20	35	21	38	12	34	14
30.8	10.45	10.9	59.59	65.8	61.56	2.3 16	40.51	15.3 19
June 9.7	10.78 33	8.9 20	59.95 36	63.9 19	61.95 39	3.9 16	40.86 35	17.2 19
19.7	11.11 33	7.0 19	60.31 36	62.3 16	62.34 39	6.0 21	41.20 34	19.3 21
29.7	11.43 32	5.3 17	60.66 35	60.9 14	62.71 37	8.4 24	41.54 34	21.7 24
July 9.7	11.73 30	3.8 15	60.99 33	59.9 10	63.05 34	11.1 27	41.85 31	24.2 25
	28	13	30	7	31	29	29	27
19.6	12.01	2.5 10	61.29	59.2	63.36	14.0 31	42.14	26.9 28
29.6	12.26 25	1.5 7	61.56 27	58.8 4	63.64 28	17.1 31	42.39 25	29.7 28
Aug. 8.6	12.47 21	0.8 7	61.79 23	58.8 0	63.86 22	20.2 31	42.60 21	32.4 27
18.5	12.64 17	0.3 5	61.98 19	59.1 3	64.04 18	23.4 32	42.77 17	35.1 27
28.5	12.76 12	0.1 2	62.12 14	59.7 6	64.17 13	26.6 32	42.90 13	37.7 26
	8	1	8	9	8	31	8	25
Sept. 7.5	12.84	0.2	62.20	60.6	64.25	29.7 29	42.98	40.2 22
17.5	12.88 4	0.5 3	62.24 4	61.7 11	64.28 3	32.6 29	43.02 4	42.4 20
27.4	12.87 1	1.0 5	62.24 0	62.9 12	64.26 2	35.3 27	43.01 1	44.4 17
Oct. 7.4	12.84 3	1.7 7	62.19 5	64.2 13	64.20 6	37.7 24	42.98 3	46.1 17
17.4	12.77 7	2.4 7	62.11 8	65.6 14	64.10 10	39.8 21	42.91 7	47.6 15
	10	8	11	13	13	18	10	12
27.4	12.67	3.2	62.00	66.9	63.97	41.6 13	42.81	48.8 8
Nov. 6.3	12.56 11	4.0 8	61.87 13	68.1 12	63.82 15	42.9 13	42.70 11	49.6 5
16.3	12.44 12	4.8 8	61.73 14	69.2 11	63.65 17	43.9 10	42.57 13	50.1 1
26.3	12.32 12	5.5 7	61.58 15	70.0 8	63.47 18	44.4 5	42.44 13	50.2 2
Dec. 6.2	12.20 12	6.2 7	61.44 14	70.6 6	63.28 19	44.4 0	42.30 14	50.0 6
	11	5	13	3	18	4	14	
16.2	12.09	6.7	61.31	70.9	63.10	44.0 8	42.16	49.4 8
26.2	11.99 10	7.0 3	61.19 12	70.9 0	62.92 18	43.2 8	42.04 12	48.6 12
36.2	11.91 8	7.2 2	61.08 11	70.7 2	62.76 16	41.9 13	41.92 12	47.4 12
Sec $\delta$ , Tan $\delta$	1.042	-0.292	1.156	-0.579	1.343	+0.896	1.129	+0.523
Mean Place	8°.435	23''-30	57°.408	83''-03	60°.406	8''-08	39°.097	17''-25
D' $\psi$ a, D $\omega$ a	0.00	+0.02	0.00	+0.04	-0.01	-0.06	0.00	-0.03
D $\psi$ $\delta$ , D $\omega$ $\delta$	+0.4	-0.3	+0.4	-0.3	+0.4	-0.3	+0.4	-0.3

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\alpha$ Pegasi. (Markab.) Mag. 2.6		$\delta$ Pegasi. Mag. 4.7		$\gamma^2$ Aquarii. Mag. 3.8		$\pi$ Cephei. Mag. 4.6	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.	Right Ascension.	Declination N.
	h m 23 0 s	° ' " + 14 44 "	h m 23 2 s	° ' " + 8 56 "	h m 23 4 s	° ' " - 21 37 "	h m 23 5 s	° ' " + 74 55 "
n. 1.2	31.37	56.7	43.22	63.3	55.16	69.1	7.95	59.7
11.2	31.28 9	55.6 11	43.14 8	62.4 9	55.08 8	69.1 0	7.27 68	58.4 13
21.1	31.22 6	54.5 11	43.08 6	61.4 10	55.02 6	68.8 3	6.66 61	56.6 18
31.1	31.17 5	53.2 13	43.04 4	60.5 9	54.98 4	68.3 5	6.15 51	54.3 23
b. 10.1	31.15 2	52.0 12	43.02 2	59.5 10	54.96 2	67.5 8	5.75 40	51.7 26
	31.16 1	50.9 11	43.03 1	58.7 8	54.97 1	66.5 10	5.49 26	48.8 29
20.0	31.16	50.9	43.03	58.7	54.97	66.5	5.49	48.8
tr. 2.0	31.20 4	49.9 10	43.07 4	58.1 6	55.02 5	65.3 12	5.38 11	45.7 31
12.0	31.28 8	49.1 8	43.14 7	57.6 5	55.09 7	63.9 14	5.43 5	42.6 31
22.0	31.39 11	48.5 6	43.25 11	57.4 2	55.21 12	62.3 16	5.63 20	39.6 30
31.9	31.54 15	48.3 2	43.40 15	57.4 0	55.36 15	60.5 18	5.99 36	36.9 27
	31.54 18	48.3 0	43.40 18	57.4 4	55.36 18	60.5 19	5.99 50	36.9 24
tr. 10.9	31.72	48.3	43.58	57.8	55.54	58.6	6.49	34.5
20.9	31.95 23	48.7 4	43.80 22	58.5 7	55.76 22	56.5 21	7.11 62	32.5 20
30.9	32.21 26	49.5 8	44.05 25	59.5 10	56.02 26	54.3 22	7.85 74	31.1 14
ly 10.8	32.49 28	50.6 11	44.33 28	60.8 13	56.31 29	52.1 22	8.67 82	30.2 9
20.8	32.79 30	52.0 14	44.63 30	62.4 16	56.62 31	49.9 22	9.54 87	29.9 3
	32.79 32	52.0 18	44.63 31	62.4 18	56.62 32	49.9 21	9.54 90	29.9 3
30.8	33.11	53.8	44.94	64.2	56.94	47.8	10.44	30.2
ne 9.7	33.44 33	55.8 20	45.27 33	66.2 20	57.28 34	45.7 21	11.35 91	31.0 8
19.7	33.77 33	57.9 21	45.59 32	68.3 21	57.62 34	43.8 19	12.24 89	32.4 14
29.7	34.08 31	60.2 23	45.90 31	70.5 22	57.95 33	42.2 16	13.09 85	34.4 20
ly 9.7	34.38 30	62.5 23	46.20 30	72.8 23	58.27 32	40.8 14	13.87 78	36.8 24
	34.38 28	62.5 24	46.20 28	72.8 22	58.27 30	40.8 12	13.87 69	36.8 28
19.6	34.66	64.9	46.48	75.0	58.57	39.6	14.56	39.6
29.6	34.90 24	67.2 23	46.72 24	77.1 21	58.83 26	38.8 8	15.15 59	42.8 32
g. 8 6	35.11 21	69.5 23	46.93 21	79.1 20	59.06 23	38.3 5	15.64 49	46.3 35
18.6	35.28 17	71.6 21	47.10 17	81.0 19	59.25 19	38.1 2	16.00 36	50.0 37
28.5	35.40 12	73.5 19	47.22 12	82.6 16	59.39 14	38.2 1	16.23 23	53.8 38
	35.40 8	73.5 18	47.22 9	82.6 14	59.39 9	38.2 4	16.23 11	53.8 38
pt. 7.5	35.48	75.3	47.31	84.0	59.48	38.6	16.34	57.6
17.5	35.53 5	76.8 15	47.36 5	85.2 12	59.54 6	39.2 6	16.32 2	61.4 38
27.4	35.53 0	78.1 13	47.37 1	86.2 10	59.55 1	40.0 8	16.17 15	65.1 37
t. 7.4	35.51 2	79.2 11	47.34 3	86.9 7	59.52 3	40.9 9	15.91 26	68.6 35
17.4	35.45 6	80.0 8	47.29 5	87.4 5	59.46 6	42.0 11	15.53 38	71.9 33
	35.45 8	80.0 5	47.29 8	87.4 3	59.46 9	42.0 11	15.53 48	71.9 29
27.4	35.37	80.5	47.21	87.7	59.37	43.1	15.05	74.8
v. 6.3	35.27 10	80.8 3	47.12 9	87.8 1	59.26 11	44.1 10	14.49 56	77.3 25
16.3	35.16 11	80.9 1	47.01 11	87.7 1	59.14 12	45.0 9	13.85 64	79.4 21
26.3	35.05 11	80.7 2	46.90 11	87.4 3	59.01 13	45.9 9	13.16 69	80.9 15
c. 6.3	34.93 12	80.3 4	46.79 11	86.9 5	58.89 12	46.6 7	12.43 73	81.8 9
	34.93 11	80.3 7	46.79 11	86.9 7	58.89 12	46.6 5	12.43 75	81.8 3
16.2	34.82	79.6	46.68	86.2	58.77	47.1	11.68	82.1
26.2	34.71 11	78.8 8	46.58 10	85.4 8	58.66 11	47.4 3	10.94 74	81.8 3
36.2	34.61 10	77.8 10	46.49 9	84.6 8	58.56 10	47.5 1	10.23 71	80.9 9
l, Tan $\delta$	1.034	+0.263	1.012	+0.158	1.076	-0.397	3.847	+3.714
1 Place	31 <sup>s</sup> .530	51 <sup>''</sup> .74	43 <sup>s</sup> .301	60 <sup>''</sup> .14	54 <sup>s</sup> .972	62 <sup>''</sup> .67	11 <sup>s</sup> .435	40 <sup>''</sup> .18
1, D <sub>a</sub> $\alpha$	0.00	-0.02	0.00	-0.01	0.00	+0.03	-0.02	-0.24
1, D <sub>a</sub> $\delta$	+0.4	-0.3	+0.4	-0.2	+0.4	-0.2	+0.4	-0.2



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♊ Aquarii. Mag. 4.5		♑ Tucanæ. Mag. 4.1		♐ Piscium. Mag. 3.8		♎ Sculptoris. Mag. 4.5	
	Right Ascension.	Declination S.	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 23 11 s	° ' " — 9 32 "	h m 23 12 s	° ' " — 58 41 "	h m 23 12 s	° ' " + 2 49 "	h m 23 14 s	° ' " — 32 59 "
Jan. 1.2	26.52	65.7	28.99	83.0	45.55	5.2	14.52	52.5
11.2	26.44 <sup>8</sup>	66.1 <sup>4</sup>	28.75 <sup>24</sup>	81.6 <sup>14</sup>	45.47 <sup>8</sup>	4.5 <sup>7</sup>	14.41 <sup>11</sup>	52.1 <sup>4</sup>
21.1	26.38 <sup>6</sup>	66.3 <sup>2</sup>	28.56 <sup>19</sup>	79.8 <sup>18</sup>	45.41 <sup>6</sup>	3.8 <sup>7</sup>	14.32 <sup>9</sup>	51.3 <sup>8</sup>
31.1	26.34 <sup>4</sup>	66.4 <sup>1</sup>	28.41 <sup>15</sup>	77.5 <sup>23</sup>	45.37 <sup>4</sup>	3.1 <sup>7</sup>	14.26 <sup>6</sup>	50.3 <sup>10</sup>
Feb. 10.1	26.32 <sup>2</sup> <sup>0</sup>	66.3 <sup>1</sup> <sup>2</sup>	28.31 <sup>10</sup> <sup>4</sup>	74.9 <sup>26</sup> <sup>29</sup>	45.35 <sup>2</sup> <sup>0</sup>	2.5 <sup>6</sup> <sup>4</sup>	14.23 <sup>3</sup> <sup>1</sup>	48.9 <sup>14</sup> <sup>16</sup>
20.1	26.32	66.1	28.27	72.0	45.35	2.1	14.22	47.3
Mar. 2.0	26.36 <sup>4</sup>	65.6 <sup>5</sup>	28.28 <sup>1</sup>	68.9 <sup>31</sup>	45.38 <sup>3</sup>	1.8 <sup>3</sup>	14.25 <sup>3</sup>	45.4 <sup>19</sup>
12.0	26.43 <sup>7</sup>	64.9 <sup>7</sup>	28.35 <sup>7</sup>	65.6 <sup>33</sup>	45.45 <sup>7</sup>	1.7 <sup>1</sup>	14.32 <sup>7</sup>	43.4 <sup>20</sup>
22.0	26.53 <sup>10</sup>	64.0 <sup>9</sup>	28.49 <sup>14</sup>	62.3 <sup>33</sup>	45.55 <sup>10</sup>	1.8 <sup>1</sup>	14.43 <sup>11</sup>	41.1 <sup>23</sup>
31.9	26.67 <sup>14</sup> <sup>17</sup>	62.9 <sup>11</sup> <sup>13</sup>	28.69 <sup>20</sup> <sup>26</sup>	58.9 <sup>34</sup> <sup>34</sup>	45.68 <sup>13</sup> <sup>18</sup>	2.2 <sup>4</sup> <sup>7</sup>	14.58 <sup>15</sup> <sup>18</sup>	38.7 <sup>24</sup> <sup>25</sup>
Apr. 10.9	26.84	61.6	28.95	55.5	45.86	2.9	14.76	36.2
20.9	27.05 <sup>21</sup>	60.0 <sup>16</sup>	29.28 <sup>33</sup>	52.3 <sup>32</sup>	46.07 <sup>21</sup>	3.9 <sup>10</sup>	14.99 <sup>23</sup>	33.7 <sup>25</sup>
30.9	27.30 <sup>25</sup>	58.2 <sup>18</sup>	29.65 <sup>37</sup>	49.3 <sup>30</sup>	46.31 <sup>24</sup>	5.2 <sup>13</sup>	15.25 <sup>26</sup>	31.1 <sup>26</sup>
May 10.8	27.57 <sup>27</sup>	56.3 <sup>19</sup>	30.07 <sup>42</sup>	46.5 <sup>28</sup>	46.58 <sup>27</sup>	6.7 <sup>15</sup>	15.55 <sup>30</sup>	28.6 <sup>25</sup>
20.8	27.87 <sup>30</sup> <sup>31</sup>	54.3 <sup>20</sup> <sup>20</sup>	30.53 <sup>46</sup> <sup>50</sup>	44.1 <sup>24</sup> <sup>21</sup>	46.88 <sup>30</sup> <sup>31</sup>	8.4 <sup>17</sup> <sup>19</sup>	15.88 <sup>33</sup> <sup>35</sup>	26.2 <sup>24</sup> <sup>22</sup>
30.8	28.18	52.3	31.03	42.0	47.19	10.3	16.23	24.0
June 9.8	28.50 <sup>32</sup>	50.2 <sup>21</sup>	31.55 <sup>52</sup>	40.3 <sup>17</sup>	47.51 <sup>32</sup>	12.3 <sup>20</sup>	16.59 <sup>36</sup>	22.0 <sup>20</sup>
19.7	28.83 <sup>33</sup>	48.2 <sup>20</sup>	32.07 <sup>52</sup>	39.0 <sup>13</sup>	47.83 <sup>32</sup>	14.4 <sup>21</sup>	16.95 <sup>36</sup>	20.2 <sup>18</sup>
29.7	29.15 <sup>32</sup>	46.2 <sup>20</sup>	32.58 <sup>51</sup>	38.3 <sup>7</sup>	48.15 <sup>32</sup>	16.5 <sup>21</sup>	17.31 <sup>36</sup>	18.8 <sup>14</sup>
July 9.7	29.46 <sup>31</sup> <sup>28</sup>	44.4 <sup>18</sup> <sup>16</sup>	33.08 <sup>50</sup> <sup>46</sup>	38.0 <sup>3</sup> <sup>2</sup>	48.45 <sup>30</sup> <sup>28</sup>	18.6 <sup>21</sup> <sup>20</sup>	17.66 <sup>35</sup> <sup>32</sup>	17.7 <sup>11</sup> <sup>7</sup>
19.6	29.74	42.8	33.54	38.2	48.73	20.6	17.98	17.0
29.6	30.00 <sup>26</sup>	41.4 <sup>14</sup>	33.95 <sup>41</sup>	38.9 <sup>7</sup>	48.99 <sup>26</sup>	22.5 <sup>19</sup>	18.27 <sup>29</sup>	16.6 <sup>4</sup>
Aug. 8.6	30.22 <sup>22</sup>	40.3 <sup>11</sup>	34.31 <sup>36</sup>	40.1 <sup>12</sup>	49.20 <sup>21</sup>	24.3 <sup>18</sup>	18.52 <sup>25</sup>	16.6 <sup>0</sup>
18.6	30.40 <sup>18</sup>	39.4 <sup>9</sup>	34.60 <sup>29</sup>	41.7 <sup>16</sup>	49.38 <sup>18</sup>	25.8 <sup>15</sup>	18.73 <sup>21</sup>	17.0 <sup>4</sup>
28.5	30.54 <sup>14</sup> <sup>10</sup>	38.8 <sup>6</sup> <sup>3</sup>	34.82 <sup>22</sup> <sup>14</sup>	43.6 <sup>19</sup> <sup>22</sup>	49.52 <sup>14</sup> <sup>10</sup>	27.1 <sup>13</sup> <sup>11</sup>	18.89 <sup>16</sup> <sup>12</sup>	17.7 <sup>7</sup> <sup>10</sup>
Sept. 7.5	30.64	38.5	34.96	45.8	49.62	28.2	19.01	18.7
17.5	30.70 <sup>6</sup>	38.4 <sup>1</sup>	35.02 <sup>6</sup>	48.2 <sup>24</sup>	49.68 <sup>6</sup>	29.1 <sup>9</sup>	19.07 <sup>6</sup>	20.0 <sup>13</sup>
27.5	30.72 <sup>2</sup>	38.5 <sup>1</sup>	35.01 <sup>1</sup>	50.7 <sup>25</sup>	49.70 <sup>2</sup>	29.7 <sup>6</sup>	19.08 <sup>1</sup>	21.4 <sup>14</sup>
Oct. 7.4	30.71 <sup>1</sup>	38.8 <sup>3</sup>	34.92 <sup>9</sup>	53.2 <sup>25</sup>	49.69 <sup>1</sup>	30.1 <sup>4</sup>	19.05 <sup>3</sup>	22.9 <sup>15</sup>
17.4	30.66 <sup>5</sup> <sup>7</sup>	39.3 <sup>5</sup> <sup>6</sup>	34.76 <sup>16</sup> <sup>22</sup>	55.6 <sup>24</sup> <sup>21</sup>	49.65 <sup>4</sup> <sup>7</sup>	30.2 <sup>1</sup> <sup>0</sup>	18.99 <sup>6</sup> <sup>10</sup>	24.5 <sup>16</sup> <sup>15</sup>
27.4	30.59	39.9	34.54	57.7	49.58	30.2	18.89	26.0
Nov. 6.3	30.50 <sup>9</sup>	40.5 <sup>6</sup>	34.28 <sup>26</sup>	59.5 <sup>18</sup>	49.50 <sup>8</sup>	30.1 <sup>1</sup>	18.76 <sup>13</sup>	27.4 <sup>14</sup>
16.3	30.40 <sup>10</sup>	41.2 <sup>7</sup>	33.99 <sup>29</sup>	61.0 <sup>15</sup>	49.40 <sup>10</sup>	29.8 <sup>3</sup>	18.62 <sup>14</sup>	28.7 <sup>13</sup>
26.3	30.29 <sup>11</sup>	41.9 <sup>7</sup>	33.68 <sup>31</sup>	62.0 <sup>10</sup>	49.30 <sup>10</sup>	29.3 <sup>5</sup>	18.47 <sup>15</sup>	29.7 <sup>10</sup>
Dec. 6.3	30.18 <sup>11</sup> <sup>11</sup>	42.6 <sup>7</sup> <sup>6</sup>	33.37 <sup>31</sup> <sup>31</sup>	62.5 <sup>5</sup> <sup>0</sup>	49.19 <sup>11</sup> <sup>10</sup>	28.7 <sup>6</sup> <sup>6</sup>	18.32 <sup>15</sup> <sup>14</sup>	30.4 <sup>7</sup> <sup>4</sup>
16.2	30.07	43.2	33.06	62.5	49.09	28.1	18.18	30.8
26.2	29.97 <sup>10</sup>	43.7 <sup>5</sup>	32.77 <sup>29</sup>	61.9 <sup>6</sup>	48.99 <sup>10</sup>	27.4 <sup>7</sup>	18.04 <sup>14</sup>	30.9 <sup>1</sup>
36.2	29.88 <sup>9</sup>	44.2 <sup>5</sup>	32.51 <sup>26</sup>	60.8 <sup>11</sup>	48.90 <sup>9</sup>	26.7 <sup>7</sup>	17.92 <sup>12</sup>	30.7 <sup>2</sup>
Δ, Tan δ at Place	1.014 26°.377	—0.168 63''.17	1.925 28°.514	—1.645 68''.12	1.001 45°.512	+0.049 3''.66	1.192 14°.195	—0.649 43''.05
Δ, D <sub>α</sub> α Δ, D <sub>α</sub> δ	0.00 +0.4	+0.01 —0.2	+0.01 +0.4	+0.11 —0.2	0.00 +0.4	0.00 —0.2	0.00 +0.4	+0.04 —0.2





FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	υ Pegasi. Mag. 4.6		κ Piscium. Mag. 4.9		θ Piscium. Mag. 4.4		70 Pegasi. Mag. 4.7	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 23 21 s	° ' " + 22 56 "	h m 23 22 s	° ' " + 0 47 "	h m 23 23 s	° ' " + 5 54 "	h m 23 24 s	° ' " + 12 17 "
Jan. 1.2	7.94	17.9	34.62	25.9	39.41	46.2	51.28	34.6
11.2	7.84 <sup>10</sup>	16.8 <sup>11</sup>	34.54 <sup>8</sup>	25.2 <sup>7</sup>	39.32 <sup>9</sup>	45.4 <sup>8</sup>	51.19 <sup>9</sup>	33.7 <sup>9</sup>
21.1	7.75 <sup>9</sup>	15.5 <sup>13</sup>	34.47 <sup>7</sup>	24.6 <sup>6</sup>	39.25 <sup>7</sup>	44.6 <sup>8</sup>	51.12 <sup>7</sup>	32.7 <sup>10</sup>
31.1	7.68 <sup>7</sup>	14.0 <sup>15</sup>	34.42 <sup>5</sup>	24.0 <sup>6</sup>	39.19 <sup>6</sup>	43.8 <sup>8</sup>	51.06 <sup>6</sup>	31.7 <sup>10</sup>
Feb. 10.1	7.63 <sup>5</sup>	12.5 <sup>15</sup>	34.39 <sup>3</sup>	23.6 <sup>4</sup>	39.16 <sup>3</sup>	43.1 <sup>7</sup>	51.02 <sup>4</sup>	30.6 <sup>11</sup>
20.1	7.61	11.0	34.38	23.2	39.15	42.5	51.00	29.7
Mar. 2.0	7.62 <sup>1</sup>	9.6 <sup>14</sup>	34.40 <sup>2</sup>	23.1 <sup>1</sup>	39.17 <sup>2</sup>	42.0 <sup>5</sup>	51.02 <sup>2</sup>	28.8 <sup>9</sup>
12.0	7.68 <sup>6</sup>	8.4 <sup>12</sup>	34.46 <sup>6</sup>	23.1 <sup>0</sup>	39.22 <sup>5</sup>	41.8 <sup>2</sup>	51.07 <sup>5</sup>	28.2 <sup>6</sup>
22.0	7.77 <sup>9</sup>	7.3 <sup>11</sup>	34.55 <sup>9</sup>	23.4 <sup>3</sup>	39.31 <sup>9</sup>	41.7 <sup>1</sup>	51.16 <sup>9</sup>	27.8 <sup>4</sup>
31.9	7.90 <sup>13</sup>	6.6 <sup>7</sup>	34.67 <sup>12</sup>	23.9 <sup>5</sup>	39.43 <sup>12</sup>	42.0 <sup>3</sup>	51.28 <sup>12</sup>	27.6 <sup>2</sup>
pr. 10.9	8.08	6.2	34.84	24.7	39.59	42.5	51.44	27.8
20.9	8.29 <sup>21</sup>	6.1 <sup>1</sup>	35.04 <sup>20</sup>	25.8 <sup>11</sup>	39.79 <sup>20</sup>	43.3 <sup>8</sup>	51.65 <sup>21</sup>	28.3 <sup>5</sup>
30.9	8.54 <sup>25</sup>	6.5 <sup>4</sup>	35.27 <sup>23</sup>	27.1 <sup>13</sup>	40.03 <sup>24</sup>	44.4 <sup>11</sup>	51.88 <sup>23</sup>	29.1 <sup>8</sup>
May 10.8	8.82 <sup>28</sup>	7.2 <sup>7</sup>	35.53 <sup>26</sup>	28.7 <sup>16</sup>	40.29 <sup>26</sup>	45.8 <sup>14</sup>	52.15 <sup>27</sup>	30.2 <sup>11</sup>
20.8	9.13 <sup>31</sup>	8.3 <sup>11</sup>	35.82 <sup>29</sup>	30.4 <sup>17</sup>	40.58 <sup>29</sup>	47.4 <sup>16</sup>	52.45 <sup>30</sup>	31.6 <sup>14</sup>
30.8	9.46	9.7	36.13	32.4	40.89	49.2	52.76	33.3
June 9.8	9.80 <sup>34</sup>	11.5 <sup>18</sup>	36.45 <sup>32</sup>	34.4 <sup>20</sup>	41.21 <sup>32</sup>	51.2 <sup>20</sup>	53.08 <sup>32</sup>	35.2 <sup>19</sup>
19.7	10.14 <sup>34</sup>	13.6 <sup>21</sup>	36.77 <sup>32</sup>	36.5 <sup>21</sup>	41.53 <sup>32</sup>	53.3 <sup>21</sup>	53.41 <sup>33</sup>	37.3 <sup>21</sup>
29.7	10.47 <sup>33</sup>	15.8 <sup>22</sup>	37.09 <sup>32</sup>	38.6 <sup>21</sup>	41.85 <sup>32</sup>	55.4 <sup>21</sup>	53.73 <sup>32</sup>	39.5 <sup>22</sup>
July 9.7	10.79 <sup>32</sup>	18.2 <sup>24</sup>	37.40 <sup>31</sup>	40.6 <sup>20</sup>	42.16 <sup>31</sup>	57.6 <sup>22</sup>	54.04 <sup>31</sup>	41.8 <sup>23</sup>
19.6	11.08	20.7	37.68	42.6	42.44	59.7	54.33	44.0
29.6	11.35 <sup>27</sup>	23.3 <sup>26</sup>	37.94 <sup>26</sup>	44.4 <sup>18</sup>	42.70 <sup>26</sup>	61.7 <sup>20</sup>	54.59 <sup>26</sup>	46.3 <sup>23</sup>
Aug. 8.6	11.58 <sup>23</sup>	25.8 <sup>25</sup>	38.16 <sup>22</sup>	46.1 <sup>17</sup>	42.93 <sup>23</sup>	63.6 <sup>19</sup>	54.82 <sup>23</sup>	48.4 <sup>21</sup>
18.6	11.77 <sup>19</sup>	28.3 <sup>25</sup>	38.35 <sup>19</sup>	47.5 <sup>14</sup>	43.11 <sup>18</sup>	65.3 <sup>17</sup>	55.01 <sup>19</sup>	50.4 <sup>20</sup>
28.5	11.92 <sup>15</sup>	30.6 <sup>23</sup>	38.50 <sup>15</sup>	48.7 <sup>12</sup>	43.26 <sup>15</sup>	66.8 <sup>15</sup>	55.16 <sup>15</sup>	52.2 <sup>18</sup>
Sept. 7.5	12.02	32.8	38.61	49.7	43.37	68.0	55.27	53.9
17.5	12.09 <sup>7</sup>	34.8 <sup>20</sup>	38.68 <sup>7</sup>	50.4 <sup>7</sup>	43.44 <sup>7</sup>	69.0 <sup>10</sup>	55.34 <sup>7</sup>	55.3 <sup>14</sup>
27.5	12.11 <sup>2</sup>	36.6 <sup>18</sup>	38.71 <sup>3</sup>	50.9 <sup>5</sup>	43.47 <sup>3</sup>	69.8 <sup>8</sup>	55.37 <sup>3</sup>	56.5 <sup>12</sup>
Oct. 7.4	12.10 <sup>1</sup>	38.2 <sup>16</sup>	38.70 <sup>1</sup>	51.2 <sup>3</sup>	43.46 <sup>1</sup>	70.4 <sup>6</sup>	55.36 <sup>1</sup>	57.4 <sup>9</sup>
17.4	12.06 <sup>4</sup>	39.5 <sup>13</sup>	38.67 <sup>3</sup>	51.2 <sup>0</sup>	43.43 <sup>3</sup>	70.8 <sup>4</sup>	55.33 <sup>3</sup>	58.1 <sup>7</sup>
27.4	11.99	40.5	38.61	51.1	43.37	70.9	55.27	58.6
Nov. 6.3	11.90 <sup>9</sup>	41.2 <sup>7</sup>	38.53 <sup>8</sup>	50.8 <sup>3</sup>	43.29 <sup>8</sup>	70.9 <sup>0</sup>	55.19 <sup>8</sup>	58.8 <sup>2</sup>
16.3	11.80 <sup>10</sup>	41.6 <sup>4</sup>	38.44 <sup>9</sup>	50.4 <sup>4</sup>	43.20 <sup>9</sup>	70.7 <sup>2</sup>	55.10 <sup>9</sup>	58.8 <sup>0</sup>
26.3	11.68 <sup>12</sup>	41.7 <sup>1</sup>	38.34 <sup>10</sup>	49.9 <sup>5</sup>	43.10 <sup>10</sup>	70.3 <sup>4</sup>	55.00 <sup>10</sup>	58.6 <sup>2</sup>
Dec. 6.3	11.56 <sup>12</sup>	41.5 <sup>2</sup>	38.23 <sup>11</sup>	49.4 <sup>5</sup>	42.99 <sup>11</sup>	69.8 <sup>5</sup>	54.89 <sup>11</sup>	58.3 <sup>3</sup>
16.2	11.43	41.1	38.12	48.7	42.89	69.2	54.78	57.7
26.2	11.31 <sup>12</sup>	40.3 <sup>8</sup>	38.02 <sup>10</sup>	48.1 <sup>6</sup>	42.78 <sup>11</sup>	68.5 <sup>7</sup>	54.67 <sup>11</sup>	57.0 <sup>7</sup>
36.2	11.20 <sup>11</sup>	39.3 <sup>10</sup>	37.93 <sup>9</sup>	47.4 <sup>7</sup>	42.69 <sup>9</sup>	67.7 <sup>8</sup>	54.57 <sup>10</sup>	56.1 <sup>9</sup>
δ, Tan δ in Place	1.086 8°.086	+0.423 9'' .35	1.000 34°.509	+0.014 24'' .69	1.005 39°.334	+0.104 43'' .24	1.023 51°.274	+0.218 29'' .41
α, D <sub>α</sub> α δ, D <sub>δ</sub> δ	0.00 +0.4	-0.03 -0.2	0.00 +0.4	0.00 -0.2	0.00 +0.4	-0.01 -0.2	0.00 +0.4	-0.01 -0.2



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\beta$ Sculptoris. Mag. 4.5		72 Pegasi ( <i>mean</i> ). Mag. 5.2		$\lambda$ Andromedæ. Mag. 4.0		$\iota$ Andromedæ. Mag. 4.3	
	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion N.
	h m 23 28 s	° ' " — 38 16 "	h m 23 29 s	° ' " + 30 51 "	h m 23 33 s	° ' " + 45 59 "	h m 23 33 s	° ' " + 42 47 "
Jan. 1.2	25.46	89.7	43.77	33.5	23.45	67.1	57.37	65.8
11.2	25.33 <sup>13</sup>	89.2 <sup>5</sup>	43.64 <sup>13</sup>	32.4 <sup>11</sup>	23.27 <sup>18</sup>	65.9 <sup>12</sup>	57.20 <sup>17</sup>	64.6 <sup>12</sup>
21.1	25.22 <sup>11</sup>	88.3 <sup>9</sup>	43.53 <sup>11</sup>	31.0 <sup>14</sup>	23.10 <sup>17</sup>	64.3 <sup>16</sup>	57.05 <sup>15</sup>	63.1 <sup>15</sup>
31.1	25.13 <sup>9</sup>	87.1 <sup>12</sup>	43.44 <sup>9</sup>	29.4 <sup>16</sup>	22.95 <sup>15</sup>	62.4 <sup>19</sup>	56.91 <sup>14</sup>	61.3 <sup>18</sup>
Feb. 10.1	25.07 <sup>6</sup>	85.5 <sup>16</sup>	43.38 <sup>6</sup>	27.6 <sup>18</sup>	22.84 <sup>11</sup>	60.2 <sup>22</sup>	56.81 <sup>10</sup>	59.2 <sup>21</sup>
	3	19	4	18	7	23	7	23
20.1	25.04	83.6	43.34	25.8	22.77	57.9	56.74	56.9
Mar. 2.0	25.05 <sup>1</sup>	81.5 <sup>21</sup>	43.34 <sup>0</sup>	24.0 <sup>18</sup>	22.74 <sup>3</sup>	55.5 <sup>24</sup>	56.72 <sup>2</sup>	54.7 <sup>22</sup>
12.0	25.10 <sup>5</sup>	79.1 <sup>24</sup>	43.38 <sup>4</sup>	22.4 <sup>16</sup>	22.77 <sup>3</sup>	53.2 <sup>23</sup>	56.75 <sup>3</sup>	52.5 <sup>22</sup>
22.0	25.19 <sup>9</sup>	76.6 <sup>25</sup>	43.46 <sup>8</sup>	20.9 <sup>15</sup>	22.85 <sup>8</sup>	51.0 <sup>22</sup>	56.83 <sup>8</sup>	50.4 <sup>21</sup>
Apr. 1.0	25.32 <sup>13</sup>	73.9 <sup>27</sup>	43.59 <sup>13</sup>	19.7 <sup>12</sup>	22.99 <sup>14</sup>	49.0 <sup>20</sup>	56.96 <sup>13</sup>	48.6 <sup>18</sup>
	18	28	17	9	19	16	19	14
10.9	25.50	71.1	43.76	18.8	23.18	47.4	57.15	47.2
20.9	25.72 <sup>22</sup>	68.4 <sup>27</sup>	43.98 <sup>22</sup>	18.3 <sup>5</sup>	23.44 <sup>26</sup>	46.2 <sup>12</sup>	57.39 <sup>24</sup>	46.1 <sup>11</sup>
30.9	25.98 <sup>26</sup>	65.6 <sup>28</sup>	44.24 <sup>26</sup>	18.3 <sup>0</sup>	23.74 <sup>30</sup>	45.5 <sup>7</sup>	57.68 <sup>29</sup>	45.5 <sup>6</sup>
May 10.8	26.28 <sup>30</sup>	62.9 <sup>27</sup>	44.53 <sup>29</sup>	18.6 <sup>3</sup>	24.08 <sup>34</sup>	45.2 <sup>3</sup>	58.01 <sup>33</sup>	45.3 <sup>2</sup>
20.8	26.61 <sup>33</sup>	60.4 <sup>25</sup>	44.86 <sup>33</sup>	19.4 <sup>8</sup>	24.45 <sup>37</sup>	45.4 <sup>2</sup>	58.37 <sup>36</sup>	45.7 <sup>4</sup>
	36	24	34	12	40	7	38	8
30.8	26.97	58.0	45.20	20.6	24.85	46.1	58.75	46.5
June 9.8	27.34 <sup>37</sup>	55.9 <sup>21</sup>	45.55 <sup>35</sup>	22.2 <sup>16</sup>	25.26 <sup>41</sup>	47.3 <sup>12</sup>	59.15 <sup>40</sup>	47.8 <sup>13</sup>
19.7	27.72 <sup>38</sup>	54.1 <sup>18</sup>	45.91 <sup>36</sup>	24.1 <sup>19</sup>	25.68 <sup>42</sup>	49.0 <sup>17</sup>	59.55 <sup>40</sup>	49.5 <sup>17</sup>
29.7	28.10 <sup>38</sup>	52.7 <sup>14</sup>	46.26 <sup>35</sup>	26.3 <sup>22</sup>	26.09 <sup>41</sup>	51.0 <sup>20</sup>	59.94 <sup>39</sup>	51.6 <sup>21</sup>
July 9.7	28.47 <sup>37</sup>	51.6 <sup>11</sup>	46.60 <sup>34</sup>	28.7 <sup>24</sup>	26.47 <sup>38</sup>	53.4 <sup>24</sup>	60.31 <sup>37</sup>	54.0 <sup>24</sup>
	35	6	31	26	36	27	35	27
19.7	28.82	51.0	46.91	31.3	26.83	56.1	60.66	56.7
29.6	29.13 <sup>31</sup>	50.7 <sup>3</sup>	47.19 <sup>28</sup>	34.0 <sup>27</sup>	27.16 <sup>33</sup>	59.0 <sup>29</sup>	60.97 <sup>31</sup>	59.6 <sup>29</sup>
Aug. 8.6	29.41 <sup>28</sup>	50.9 <sup>2</sup>	47.43 <sup>24</sup>	36.8 <sup>28</sup>	27.44 <sup>28</sup>	62.1 <sup>31</sup>	61.24 <sup>27</sup>	62.6 <sup>30</sup>
18.6	29.64 <sup>23</sup>	51.5 <sup>6</sup>	47.64 <sup>21</sup>	39.6 <sup>28</sup>	27.67 <sup>23</sup>	65.3 <sup>32</sup>	61.47 <sup>23</sup>	65.7 <sup>31</sup>
28.5	29.82 <sup>18</sup>	52.4 <sup>9</sup>	47.80 <sup>16</sup>	42.2 <sup>26</sup>	27.86 <sup>19</sup>	68.5 <sup>32</sup>	61.65 <sup>18</sup>	68.8 <sup>31</sup>
	14	13	12	26	13	32	13	31
Sept. 7.5	29.96	53.7	47.92	44.8	27.99	71.7	61.78	71.9
17.5	30.04 <sup>8</sup>	55.2 <sup>15</sup>	47.99 <sup>7</sup>	47.3 <sup>25</sup>	28.07 <sup>8</sup>	74.7 <sup>30</sup>	61.86 <sup>8</sup>	74.8 <sup>29</sup>
27.5	30.07 <sup>3</sup>	56.9 <sup>17</sup>	48.02 <sup>3</sup>	49.5 <sup>22</sup>	28.10 <sup>3</sup>	77.6 <sup>29</sup>	61.89 <sup>3</sup>	77.6 <sup>28</sup>
Oct. 7.4	30.05 <sup>2</sup>	58.7 <sup>18</sup>	48.02 <sup>0</sup>	51.5 <sup>20</sup>	28.09 <sup>1</sup>	80.4 <sup>28</sup>	61.88 <sup>1</sup>	80.2 <sup>26</sup>
17.4	29.98 <sup>7</sup>	60.5 <sup>18</sup>	47.98 <sup>4</sup>	53.2 <sup>17</sup>	28.03 <sup>6</sup>	82.8 <sup>24</sup>	61.83 <sup>5</sup>	82.5 <sup>23</sup>
	9	18	7	14	10	21	8	20
27.4	29.89	62.3	47.91	54.6	27.93	84.9	61.75	84.5
Nov. 6.4	29.76 <sup>13</sup>	64.0 <sup>17</sup>	47.82 <sup>9</sup>	55.7 <sup>11</sup>	27.81 <sup>12</sup>	86.7 <sup>18</sup>	61.63 <sup>12</sup>	86.2 <sup>17</sup>
16.3	29.61 <sup>15</sup>	65.4 <sup>14</sup>	47.70 <sup>12</sup>	56.5 <sup>8</sup>	27.66 <sup>15</sup>	88.1 <sup>14</sup>	61.49 <sup>14</sup>	87.5 <sup>13</sup>
26.3	29.45 <sup>16</sup>	66.6 <sup>12</sup>	47.58 <sup>12</sup>	56.9 <sup>4</sup>	27.48 <sup>18</sup>	89.0 <sup>9</sup>	61.33 <sup>16</sup>	88.3 <sup>8</sup>
Dec. 6.3	29.28 <sup>17</sup>	67.4 <sup>8</sup>	47.44 <sup>14</sup>	56.9 <sup>0</sup>	27.29 <sup>19</sup>	89.5 <sup>5</sup>	61.16 <sup>17</sup>	88.7 <sup>4</sup>
	17	5	14	3	20	0	18	0
16.2	29.11	67.9	47.30	56.6	27.09	89.5	60.98	88.7
26.2	28.96 <sup>15</sup>	68.0 <sup>1</sup>	47.16 <sup>14</sup>	56.0 <sup>6</sup>	26.89 <sup>20</sup>	89.1 <sup>4</sup>	60.79 <sup>19</sup>	88.2 <sup>5</sup>
36.2	28.81 <sup>15</sup>	67.7 <sup>3</sup>	47.03 <sup>13</sup>	55.0 <sup>10</sup>	26.70 <sup>19</sup>	88.1 <sup>10</sup>	60.62 <sup>17</sup>	87.3 <sup>9</sup>
Sec $\delta$ , Tan $\delta$	1.274	—0.789	1.165	+0.598	1.440	+1.036	1.363	+0.926
Mean Place	25°.007	79''.13	43°.986	22''.14	23°.972	51''.23	57°.797	50''.73
D' $\phi$ $\alpha$ , D $\omega$ $\alpha$	0.00	+0.05	0.00	—0.04	0.00	—0.07	0.00	—0.06
D $\phi$ $\delta$ , D $\omega$ $\delta$	+0.4	—0.1	+0.4	—0.1	+0.4	—0.1	+0.4	—0.1

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♈ Piscium. Mag. 4.3		♄ Cephei. Mag. 3.4		♓ Andromedæ. Mag. 4.3		♒ Aquarii. Mag. 4.6	
	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination S.
	h m 23 35 s	° ' + 5 9 "	h m 23 35 s	° ' + 77 9 "	h m 23 36 s	° ' + 43 51 "	h m 23 38 s	° ' - 15 0 "
Jan. 1.2	34.80	59.0 8	47.65 85	50.4 9	12.60 17	62.8 12	19.25 9	57.1 3
11.2	34.71 9	58.2 8	46.80 85	49.5 9	12.43 17	61.6 12	19.16 9	57.4 3
21.1	34.63 8	57.4 8	46.01 79	48.1 14	12.27 16	60.1 15	19.08 8	57.4 0
31.1	34.57 6	56.7 7	45.31 70	46.2 19	12.13 14	58.3 18	19.01 7	57.3 1
Feb. 10.1	34.53 4	56.0 7	44.74 57	43.8 24	12.02 11	56.2 21	18.96 5	57.0 3
	2	6	43	27	7	23	2	6
20.1	34.51 1	55.4 4	44.31 27	41.1 30	11.95 3	53.9 23	18.94 1	56.4 8
Mar. 2.0	34.52 4	55.0 2	44.04 8	38.1 30	11.92 3	51.6 23	18.95 4	55.6 10
12.0	34.56 8	54.8 0	43.96 11	35.1 31	11.95 8	49.4 21	18.99 7	54.6 12
22.0	34.64 11	54.8 2	44.07 28	32.0 29	12.03 13	47.3 19	19.06 11	53.4 15
Apr. 1.0	34.75 16	55.0 6	44.35 46	29.1 26	12.16 19	45.4 15	19.17 15	51.9 17
10.9	34.91 19	55.6 8	44.81 63	26.5 23	12.35 24	43.9 11	19.32 19	50.2 18
20.9	35.10 22	56.4 11	45.44 77	24.2 18	12.59 29	42.8 7	19.51 23	48.4 20
30.9	35.32 26	57.5 14	46.21 88	22.4 13	12.88 33	42.1 2	19.74 25	46.4 22
May 10.8	35.58 28	58.9 16	47.09 97	21.1 7	13.21 36	41.9 3	19.99 29	44.2 22
20.8	35.86 31	60.5 18	48.06 103	20.4 2	13.57 39	42.2 7	20.28 31	42.0 22
30.8	36.17 32	62.3 19	49.09 106	20.2 4	13.96 40	42.9 13	20.59 32	39.8 21
June 9.8	36.49 32	64.2 21	50.15 105	20.6 10	14.36 41	44.2 16	20.91 33	37.7 21
19.7	36.81 32	66.3 21	51.20 102	21.6 15	14.77 39	45.8 21	21.24 33	35.6 19
29.7	37.13 31	68.4 22	52.22 97	23.1 21	15.16 38	47.9 24	21.57 32	33.7 18
July 9.7	37.44 29	70.6 20	53.19 89	25.2 25	15.54 36	50.3 27	21.89 30	31.9 15
19.7	37.73 27	72.6 20	54.08 79	27.7 29	15.90 32	53.0 29	22.19 27	30.4 12
29.6	38.00 23	74.6 18	54.87 68	30.6 32	16.22 27	55.9 30	22.46 25	29.2 10
Aug. 8.6	38.23 29	76.4 17	55.55 54	33.8 35	16.49 23	58.9 31	22.71 21	28.2 6
18.6	38.43 16	78.1 14	56.09 41	37.3 37	16.72 19	62.0 32	22.92 17	27.6 4
28.5	38.59 13	79.5 12	56.50 26	41.0 38	16.91 13	65.2 31	23.09 12	27.2 0
Sept. 7.5	38.72 8	80.7 10	56.76 12	44.8 39	17.04 9	68.3 30	23.21 9	27.2 2
17.5	38.80 4	81.7 8	56.88 3	48.7 38	17.13 3	71.3 28	23.30 4	27.4 4
27.5	38.84 1	82.5 5	56.85 17	52.5 37	17.16 1	74.1 26	23.34 1	27.8 7
Oct. 7.4	38.85 2	83.0 3	56.68 31	56.2 35	17.15 5	76.7 21	23.35 2	28.5 8
17.4	38.83 5	83.3 1	56.37 44	59.7 32	17.10 8	79.1 21	23.33 6	29.3 9
27.4	38.78 7	83.4 1	55.93 55	62.9 29	17.02 12	81.2 17	23.27 7	30.2 10
Nov. 6.4	38.71 8	83.3 2	55.38 66	65.8 24	16.90 14	82.9 13	23.20 10	31.2 9
16.3	38.63 10	83.1 4	54.72 75	68.2 20	16.76 16	84.2 9	23.10 10	32.1 9
26.3	38.53 10	82.7 6	53.97 82	70.2 14	16.60 18	85.1 5	23.00 11	33.0 8
Dec. 6.3	38.43 10	82.1 6	53.15 85	71.6 8	16.42 18	85.6 0	22.89 12	33.8 7
16.2	38.33 10	81.5 7	52.30 88	72.4 2	16.24 19	85.6 5	22.77 10	34.5 5
26.2	38.23 10	80.8 7	51.42 87	72.6 5	16.05 18	85.1 9	22.67 11	35.0 4
36.2	38.13	80.1 7	50.55	72.1	15.87	84.2	22.56	35.4
δ, Tan δ in Place	1.004 34°.656	+0.090 55''.78	4.501 50°.979	+4.388 28''.64	1.387 13°.039	+0.961 47''.31	1.035 18°.918	-0.268 53''.55
α, D <sub>α</sub> α	0.00	-0.01	-0.01	-0.29	0.00	-0.06	0.00	+0.02
δ, D <sub>α</sub> δ	+0.4	-0.1	+0.4	-0.1	+0.4	-0.1	+0.4	-0.1



FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	$\gamma^1$ Octantis. Mag. 5.1		$\phi$ Pegasi. Mag. 5.2		$\rho$ Cassiopeiæ. Mag. 4.8		Groombridge 4163. Mag. 6.6	
	Right Ascension.	Declination S.	Right Ascension.	Declination N.	Right Ascension.	Declination N.	Right Ascension.	Declination N.
	h m 23 47 s	° ' " — 82 28 "	h m 23 48 s	° ' " + 18 38 "	h m 23 50 s	° ' " + 57 1 "	h m 23 50 s	° ' " + 73 56 "
n. 1.2	11.25	105.1	9.76	61.7	7.02	54.7	38.52	36.3
11.2	9.82 <sup>143</sup>	103.4 <sup>17</sup>	9.66 <sup>10</sup>	60.8 <sup>9</sup>	6.74 <sup>28</sup>	53.8 <sup>9</sup>	37.85 <sup>67</sup>	35.7 <sup>6</sup>
21.2	8.52 <sup>130</sup>	101.1 <sup>23</sup>	9.56 <sup>10</sup>	59.7 <sup>11</sup>	6.48 <sup>26</sup>	52.4 <sup>14</sup>	37.22 <sup>63</sup>	34.4 <sup>13</sup>
31.1	7.40 <sup>112</sup>	98.4 <sup>27</sup>	9.48 <sup>8</sup>	58.5 <sup>12</sup>	6.24 <sup>24</sup>	50.5 <sup>19</sup>	36.66 <sup>56</sup>	32.6 <sup>18</sup>
b. 10.1	6.49 <sup>91</sup>	95.2 <sup>32</sup>	9.41 <sup>7</sup>	57.3 <sup>12</sup>	6.05 <sup>19</sup>	48.3 <sup>22</sup>	36.19 <sup>47</sup>	30.3 <sup>23</sup>
	69	35	4	12	14	24	37	26
20.1	5.80	91.7	9.37	56.1	5.91	45.9	35.82	27.7
ar. 2.0	5.35 <sup>45</sup>	88.0 <sup>37</sup>	9.36 <sup>1</sup>	55.0 <sup>11</sup>	5.82 <sup>9</sup>	43.3 <sup>26</sup>	35.58 <sup>24</sup>	24.8 <sup>29</sup>
12.0	5.16 <sup>19</sup>	84.2 <sup>38</sup>	9.39 <sup>3</sup>	54.0 <sup>10</sup>	5.81 <sup>1</sup>	40.6 <sup>27</sup>	35.48 <sup>10</sup>	21.8 <sup>30</sup>
22.0	5.21 <sup>5</sup>	80.2 <sup>40</sup>	9.45 <sup>6</sup>	53.2 <sup>8</sup>	5.87 <sup>6</sup>	38.0 <sup>26</sup>	35.52 <sup>4</sup>	18.8 <sup>30</sup>
pr. 1.0	5.52 <sup>31</sup>	76.3 <sup>39</sup>	9.55 <sup>10</sup>	52.7 <sup>5</sup>	6.00 <sup>13</sup>	35.6 <sup>24</sup>	35.72 <sup>20</sup>	16.0 <sup>28</sup>
	55	38	15	3	20	22	34	27
10.9	6.07	72.5	9.70	52.4	6.20	33.4	36.06	13.3
20.9	6.85 <sup>78</sup>	68.9 <sup>36</sup>	9.89 <sup>19</sup>	52.5 <sup>1</sup>	6.48 <sup>28</sup>	31.7 <sup>17</sup>	36.54 <sup>48</sup>	11.0 <sup>23</sup>
30.9	7.85 <sup>100</sup>	65.6 <sup>33</sup>	10.11 <sup>22</sup>	52.9 <sup>4</sup>	6.82 <sup>34</sup>	30.4 <sup>13</sup>	37.14 <sup>60</sup>	9.1 <sup>19</sup>
ay 10.9	9.06 <sup>121</sup>	62.6 <sup>30</sup>	10.38 <sup>27</sup>	53.7 <sup>8</sup>	7.22 <sup>40</sup>	29.5 <sup>9</sup>	37.84 <sup>70</sup>	7.8 <sup>13</sup>
20.8	10.42 <sup>136</sup>	60.0 <sup>26</sup>	10.67 <sup>29</sup>	54.8 <sup>11</sup>	7.66 <sup>44</sup>	29.2 <sup>3</sup>	38.62 <sup>78</sup>	6.9 <sup>9</sup>
	150	22	31	14	48	2	84	3
30.8	11.92	57.8	10.98	56.2	8.14	29.4	39.46	6.6
ine 9.8	13.53 <sup>161</sup>	56.1 <sup>17</sup>	11.31 <sup>33</sup>	57.9 <sup>17</sup>	8.64 <sup>50</sup>	30.2 <sup>8</sup>	40.32 <sup>86</sup>	6.9 <sup>3</sup>
19.7	15.20 <sup>167</sup>	55.0 <sup>11</sup>	11.64 <sup>33</sup>	59.9 <sup>20</sup>	9.14 <sup>50</sup>	31.4 <sup>12</sup>	41.20 <sup>88</sup>	7.8 <sup>9</sup>
29.7	16.90 <sup>170</sup>	54.4 <sup>6</sup>	11.97 <sup>33</sup>	62.0 <sup>21</sup>	9.63 <sup>49</sup>	33.2 <sup>18</sup>	42.06 <sup>86</sup>	9.2 <sup>14</sup>
ily 9.7	18.57 <sup>167</sup>	54.3 <sup>1</sup>	12.30 <sup>33</sup>	64.3 <sup>23</sup>	10.11 <sup>48</sup>	35.3 <sup>21</sup>	42.89 <sup>83</sup>	11.1 <sup>19</sup>
	160	6	30	23	44	26	77	24
19.7	20.17	54.9	12.60	66.6	10.55	37.9	43.66	13.5
29.6	21.65 <sup>148</sup>	56.0 <sup>11</sup>	12.88 <sup>28</sup>	69.0 <sup>24</sup>	10.96 <sup>41</sup>	40.8 <sup>29</sup>	44.36 <sup>70</sup>	16.2 <sup>27</sup>
ug. 8.6	22.96 <sup>131</sup>	57.6 <sup>16</sup>	13.13 <sup>25</sup>	71.3 <sup>23</sup>	11.31 <sup>35</sup>	43.9 <sup>31</sup>	44.96 <sup>60</sup>	19.4 <sup>32</sup>
18.6	24.06 <sup>110</sup>	59.6 <sup>20</sup>	13.34 <sup>21</sup>	73.6 <sup>23</sup>	11.61 <sup>30</sup>	47.2 <sup>33</sup>	45.47 <sup>51</sup>	22.8 <sup>34</sup>
28.6	24.92 <sup>86</sup>	62.1 <sup>25</sup>	13.52 <sup>18</sup>	75.7 <sup>21</sup>	11.86 <sup>25</sup>	50.6 <sup>34</sup>	45.87 <sup>40</sup>	26.4 <sup>36</sup>
	58	27	13	19	18	35	28	37
pt. 7.5	25.50	64.8	13.65	77.6	12.04	54.1	46.15	30.1
17.5	25.78 <sup>28</sup>	67.8 <sup>30</sup>	13.74 <sup>9</sup>	79.4 <sup>18</sup>	12.15 <sup>11</sup>	57.5 <sup>34</sup>	46.32 <sup>17</sup>	33.9 <sup>38</sup>
27.5	25.76 <sup>2</sup>	70.8 <sup>30</sup>	13.80 <sup>6</sup>	81.0 <sup>16</sup>	12.21 <sup>6</sup>	60.9 <sup>34</sup>	46.37 <sup>5</sup>	37.7 <sup>38</sup>
ct. 7.4	25.43 <sup>33</sup>	73.8 <sup>30</sup>	13.82 <sup>2</sup>	82.3 <sup>13</sup>	12.20 <sup>1</sup>	64.1 <sup>32</sup>	46.31 <sup>6</sup>	41.4 <sup>37</sup>
17.4	24.80 <sup>63</sup>	76.6 <sup>28</sup>	13.81 <sup>1</sup>	83.4 <sup>11</sup>	12.15 <sup>5</sup>	67.0 <sup>29</sup>	46.13 <sup>18</sup>	44.9 <sup>35</sup>
	90	26	4	8	11	27	28	32
27.4	23.90	79.2	13.77	84.2	12.04	69.7	45.85	48.1
ov. 6.4	22.76 <sup>114</sup>	81.4 <sup>22</sup>	13.70 <sup>7</sup>	84.8 <sup>6</sup>	11.88 <sup>16</sup>	72.1 <sup>24</sup>	45.47 <sup>38</sup>	51.0 <sup>29</sup>
16.3	21.42 <sup>134</sup>	83.1 <sup>17</sup>	13.62 <sup>8</sup>	85.1 <sup>3</sup>	11.68 <sup>20</sup>	74.0 <sup>19</sup>	45.00 <sup>47</sup>	53.5 <sup>25</sup>
26.3	19.94 <sup>148</sup>	84.2 <sup>11</sup>	13.53 <sup>9</sup>	85.2 <sup>1</sup>	11.45 <sup>23</sup>	75.5 <sup>15</sup>	44.45 <sup>55</sup>	55.6 <sup>21</sup>
ec. 6.3	18.36 <sup>158</sup>	84.8 <sup>6</sup>	13.42 <sup>11</sup>	85.0 <sup>2</sup>	11.20 <sup>25</sup>	76.5 <sup>10</sup>	43.85 <sup>60</sup>	57.1 <sup>15</sup>
	161	1	11	4	28	5	65	9
16.3	16.75	84.7	13.31	84.6	10.92	77.0	43.20	58.0
26.2	15.16 <sup>159</sup>	84.0 <sup>7</sup>	13.19 <sup>12</sup>	84.0 <sup>6</sup>	10.64 <sup>28</sup>	76.9 <sup>1</sup>	42.52 <sup>68</sup>	58.3 <sup>3</sup>
36.2	13.64 <sup>152</sup>	82.7 <sup>13</sup>	13.08 <sup>11</sup>	83.2 <sup>8</sup>	10.36 <sup>28</sup>	76.3 <sup>6</sup>	41.85 <sup>67</sup>	58.0 <sup>3</sup>
$\delta$ , Tan $\delta$	7.650	—7.584	1.055	+0.338	1.838	+1.542	3.615	+3.474
m Place	9°.199	88''.43	9°.684	53''.44	7°.747	35''.42	40°.703	14''.18
$\alpha$ , $D_{\alpha} \alpha$	+0.01	+0.51	0.00	—0.02	0.00	—0.10	0.00	—0.23
$\delta$ , $D_{\delta} \delta$	+0.4	—0.1	+0.4	—0.1	+0.4	0.0	+0.4	0.0

FOR THE UPPER TRANSIT AT WASHINGTON.

Mean Solar Date.	♊ Piscium. Mag. 4.0		♉ Tucanæ. Mag. 4.7		♊ Piscium. Mag. 4.7		♋ Ceti. Mag. 4.6	
	Right Ascension.	Declina- tion N.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.	Right Ascension.	Declina- tion S.
	h m 23 54	° ' " + 6 23	h m 23 55	° ' " - 66 2	h m 23 57	° ' " - 6 28	h m 23 59	° ' " - 17 48
Jan. 1.2	56.99	38.3	31.51	74.5	36.44	71.4	23.67	37.2
11.2	56.89 <sup>10</sup>	37.6 <sup>7</sup>	31.12 <sup>39</sup>	73.4 <sup>11</sup>	36.34 <sup>10</sup>	71.9 <sup>5</sup>	23.56 <sup>11</sup>	37.4 <sup>2</sup>
21.2	56.80 <sup>9</sup>	36.8 <sup>8</sup>	30.76 <sup>36</sup>	71.7 <sup>17</sup>	36.25 <sup>9</sup>	72.3 <sup>4</sup>	23.46 <sup>10</sup>	37.5 <sup>1</sup>
31.1	56.73 <sup>7</sup>	36.1 <sup>7</sup>	30.45 <sup>31</sup>	69.5 <sup>22</sup>	36.18 <sup>7</sup>	72.5 <sup>2</sup>	23.38 <sup>8</sup>	37.3 <sup>2</sup>
Feb. 10.1	56.67 <sup>6</sup>	35.4 <sup>7</sup>	30.20 <sup>25</sup>	66.9 <sup>26</sup>	36.12 <sup>6</sup>	72.6 <sup>1</sup>	23.32 <sup>6</sup>	36.8 <sup>5</sup>
20.1	56.63 <sup>4</sup>	34.8 <sup>6</sup>	30.01 <sup>19</sup>	63.9 <sup>30</sup>	36.08 <sup>4</sup>	72.5 <sup>1</sup>	23.27 <sup>5</sup>	36.1 <sup>7</sup>
Mar. 2.1	56.62 <sup>1</sup>	34.3 <sup>5</sup>	29.89 <sup>12</sup>	60.7 <sup>32</sup>	36.07 <sup>1</sup>	72.2 <sup>3</sup>	23.26 <sup>1</sup>	35.2 <sup>9</sup>
12.0	56.64 <sup>2</sup>	34.1 <sup>2</sup>	29.85 <sup>4</sup>	57.2 <sup>35</sup>	36.09 <sup>2</sup>	71.7 <sup>5</sup>	23.27 <sup>1</sup>	35.2 <sup>12</sup>
22.0	56.70 <sup>6</sup>	34.0 <sup>1</sup>	29.89 <sup>4</sup>	53.6 <sup>36</sup>	36.09 <sup>2</sup>	71.7 <sup>5</sup>	23.27 <sup>1</sup>	34.0 <sup>12</sup>
Apr. 1.0	56.79 <sup>9</sup>	34.2 <sup>2</sup>	30.01 <sup>12</sup>	49.9 <sup>37</sup>	36.14 <sup>5</sup>	71.0 <sup>7</sup>	23.32 <sup>5</sup>	32.6 <sup>14</sup>
10.9	56.93 <sup>14</sup>	34.6 <sup>4</sup>	30.01 <sup>21</sup>	49.9 <sup>37</sup>	36.23 <sup>9</sup>	70.0 <sup>10</sup>	23.41 <sup>9</sup>	31.0 <sup>16</sup>
20.9	56.93 <sup>17</sup>	34.6 <sup>8</sup>	30.22 <sup>28</sup>	46.2 <sup>36</sup>	36.23 <sup>13</sup>	70.0 <sup>12</sup>	23.41 <sup>13</sup>	31.0 <sup>19</sup>
30.9	57.10 <sup>21</sup>	35.4 <sup>10</sup>	30.22 <sup>28</sup>	46.2 <sup>36</sup>	36.36 <sup>17</sup>	68.8 <sup>14</sup>	23.54 <sup>17</sup>	29.1 <sup>20</sup>
May 10.9	57.31 <sup>25</sup>	36.4 <sup>13</sup>	30.50 <sup>36</sup>	42.6 <sup>36</sup>	36.53 <sup>20</sup>	67.4 <sup>16</sup>	23.71 <sup>20</sup>	27.1 <sup>21</sup>
20.8	57.56 <sup>27</sup>	37.7 <sup>15</sup>	30.86 <sup>43</sup>	39.2 <sup>34</sup>	36.73 <sup>24</sup>	65.8 <sup>19</sup>	23.91 <sup>25</sup>	25.0 <sup>23</sup>
30.8	57.83 <sup>30</sup>	39.2 <sup>18</sup>	31.29 <sup>50</sup>	36.1 <sup>31</sup>	36.97 <sup>27</sup>	63.9 <sup>21</sup>	24.16 <sup>30</sup>	22.7 <sup>23</sup>
June 9.8	58.13 <sup>32</sup>	41.0 <sup>19</sup>	31.79 <sup>55</sup>	33.2 <sup>25</sup>	37.24 <sup>30</sup>	62.0 <sup>21</sup>	24.43 <sup>30</sup>	20.4 <sup>23</sup>
19.8	58.45 <sup>32</sup>	42.9 <sup>20</sup>	32.34 <sup>58</sup>	30.7 <sup>21</sup>	37.54 <sup>31</sup>	59.9 <sup>21</sup>	24.73 <sup>32</sup>	18.1 <sup>23</sup>
29.7	58.77 <sup>32</sup>	44.9 <sup>21</sup>	32.92 <sup>61</sup>	28.6 <sup>16</sup>	37.85 <sup>32</sup>	57.8 <sup>22</sup>	25.05 <sup>33</sup>	15.8 <sup>21</sup>
July 9.7	59.09 <sup>32</sup>	47.0 <sup>22</sup>	33.53 <sup>63</sup>	27.0 <sup>11</sup>	38.17 <sup>32</sup>	55.6 <sup>20</sup>	25.38 <sup>33</sup>	13.7 <sup>20</sup>
19.7	59.41 <sup>30</sup>	49.2 <sup>21</sup>	34.16 <sup>61</sup>	25.9 <sup>5</sup>	38.49 <sup>32</sup>	53.6 <sup>20</sup>	25.71 <sup>33</sup>	11.7 <sup>18</sup>
Aug. 8.6	59.71 <sup>28</sup>	51.3 <sup>20</sup>	34.77 <sup>59</sup>	25.4 <sup>0</sup>	38.81 <sup>30</sup>	51.6 <sup>18</sup>	26.04 <sup>31</sup>	9.9 <sup>15</sup>
18.6	59.99 <sup>24</sup>	53.3 <sup>18</sup>	35.36 <sup>55</sup>	25.4 <sup>5</sup>	39.11 <sup>29</sup>	49.8 <sup>16</sup>	26.35 <sup>29</sup>	8.4 <sup>12</sup>
28.6	60.23 <sup>22</sup>	55.1 <sup>18</sup>	35.91 <sup>50</sup>	25.9 <sup>10</sup>	39.40 <sup>25</sup>	48.2 <sup>14</sup>	26.64 <sup>26</sup>	7.2 <sup>9</sup>
Sept. 7.5	60.45 <sup>18</sup>	56.9 <sup>15</sup>	36.41 <sup>43</sup>	26.9 <sup>16</sup>	39.65 <sup>22</sup>	46.8 <sup>11</sup>	26.90 <sup>23</sup>	6.3 <sup>6</sup>
17.5	60.63 <sup>14</sup>	58.4 <sup>13</sup>	36.84 <sup>34</sup>	28.5 <sup>19</sup>	39.87 <sup>18</sup>	45.7 <sup>8</sup>	27.13 <sup>19</sup>	5.7 <sup>1</sup>
27.5	60.77 <sup>10</sup>	59.7 <sup>10</sup>	37.18 <sup>25</sup>	30.4 <sup>23</sup>	40.05 <sup>14</sup>	44.9 <sup>6</sup>	27.32 <sup>15</sup>	5.5 <sup>1</sup>
Oct. 7.5	60.93 <sup>6</sup>	60.7 <sup>9</sup>	37.43 <sup>15</sup>	32.7 <sup>26</sup>	40.19 <sup>10</sup>	44.3 <sup>3</sup>	27.47 <sup>10</sup>	5.6 <sup>3</sup>
17.4	60.87 <sup>3</sup>	61.6 <sup>6</sup>	37.58 <sup>6</sup>	35.3 <sup>28</sup>	40.29 <sup>7</sup>	44.0 <sup>1</sup>	27.57 <sup>7</sup>	5.9 <sup>7</sup>
27.4	60.96 <sup>1</sup>	62.2 <sup>3</sup>	37.64 <sup>4</sup>	38.1 <sup>28</sup>	40.36 <sup>3</sup>	43.9 <sup>2</sup>	27.64 <sup>3</sup>	6.6 <sup>8</sup>
Nov. 6.4	60.95 <sup>3</sup>	62.5 <sup>2</sup>	37.60 <sup>14</sup>	40.9 <sup>28</sup>	40.39 <sup>1</sup>	44.1 <sup>4</sup>	27.67 <sup>1</sup>	7.4 <sup>10</sup>
16.3	60.92 <sup>5</sup>	62.7 <sup>0</sup>	37.46 <sup>22</sup>	43.7 <sup>26</sup>	40.38 <sup>3</sup>	44.5 <sup>5</sup>	27.66 <sup>4</sup>	8.4 <sup>11</sup>
26.3	60.87 <sup>7</sup>	62.7 <sup>2</sup>	37.24 <sup>30</sup>	46.3 <sup>23</sup>	40.35 <sup>5</sup>	45.0 <sup>6</sup>	27.62 <sup>6</sup>	9.5 <sup>11</sup>
36.2	60.80 <sup>9</sup>	62.5 <sup>4</sup>	36.94 <sup>35</sup>	48.6 <sup>19</sup>	40.30 <sup>8</sup>	45.6 <sup>8</sup>	27.56 <sup>9</sup>	10.6 <sup>11</sup>
Dec. 6.3	60.71 <sup>10</sup>	62.1 <sup>4</sup>	36.59 <sup>40</sup>	50.5 <sup>15</sup>	40.22 <sup>9</sup>	46.4 <sup>7</sup>	27.47 <sup>10</sup>	11.7 <sup>11</sup>
16.3	60.61 <sup>10</sup>	61.7 <sup>6</sup>	36.19 <sup>42</sup>	52.0 <sup>9</sup>	40.13 <sup>9</sup>	47.1 <sup>8</sup>	27.37 <sup>12</sup>	12.8 <sup>9</sup>
26.2	60.51 <sup>10</sup>	61.1 <sup>6</sup>	35.77 <sup>44</sup>	52.9 <sup>4</sup>	40.04 <sup>11</sup>	47.9 <sup>7</sup>	27.27 <sup>12</sup>	13.7 <sup>8</sup>
36.2	60.41 <sup>10</sup>	60.5 <sup>8</sup>	35.33 <sup>43</sup>	53.3 <sup>2</sup>	39.93 <sup>10</sup>	48.6 <sup>6</sup>	27.15 <sup>11</sup>	14.5 <sup>6</sup>
16.3	60.31 <sup>10</sup>	59.7 <sup>8</sup>	34.90 <sup>42</sup>	53.1 <sup>8</sup>	39.83 <sup>10</sup>	49.2 <sup>6</sup>	27.04 <sup>11</sup>	15.1 <sup>6</sup>
36.2	60.31 <sup>10</sup>	59.7 <sup>8</sup>	34.48 <sup>42</sup>	52.3 <sup>8</sup>	39.73 <sup>10</sup>	49.8 <sup>6</sup>	26.93 <sup>11</sup>	15.5 <sup>4</sup>
Sec δ, Tan δ	1.006	+0.112	2.463	-2.252	1.006	-0.114	1.050	-0.321
Mean Place	56°.738	34''.05	30°.465	59''.09	36°.059	71''.22	23°.188	33''.28
D'ψ a, Dω a	0.00	-0.01	0.00	+0.15	0.00	+0.01	0.00	+0.02
Dψ δ, Dω δ	+0.4	0.0	+0.4	0.0	+0.4	0.0	+0.4	0.0



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Octantis (G.). Mag. 5.6			31 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			η Octantis. Mag. 6.3		
n	Right	Declination	Mean	Right	Declination	Mean	Right	Declination	Mean	Right	Declination	Mean	Right	Declination
ur	Ascension.	South.	Solar	Ascension.	South.	Solar	Ascension.	South.	Solar	Ascension.	South.	Solar	Ascension.	South.
e.			Date.			Date.			Date.			Date.		
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
1.	1 42	-85 12	Jan.	5 46	-84 49	Jan.	7 17	-86 53	Jan.	9 9	-85 19	Jan.	10 59	-84 7
	s	"		s	"		s	"		s	"		s	"
3	19.08	10.94	0.5	51.11	46.43	0.5	18.95	44.33	0.6	21.52	13.33	0.7	56.85	55.11
3	18.81	10.93	1.5	50.98	46.74	1.5	18.88	44.68	1.6	21.62	13.67	1.7	57.02	55.38
3	18.55	10.89	2.5	50.84	47.02	2.5	18.81	45.02	2.6	21.72	14.01	2.7	57.18	55.63
3	18.30	10.88	3.5	50.72	47.29	3.5	18.74	45.34	3.6	21.81	14.33	3.7	57.34	55.86
3	18.07	10.88	4.5	50.61	47.57	4.5	18.70	45.66	4.6	21.90	14.63	4.7	57.51	56.08
3	17.85	10.88	5.5	50.51	47.86	5.5	18.67	45.98	5.6	22.01	14.94	5.7	57.67	56.30
3	17.61	10.90	6.4	50.41	48.16	6.5	18.66	46.31	6.6	22.13	15.25	6.7	57.85	56.52
3	17.34	10.93	7.4	50.31	48.48	7.5	18.64	46.67	7.6	22.26	15.58	7.7	58.05	56.75
3	17.06	10.96	8.4	50.20	48.83	8.5	18.61	47.05	8.6	22.40	15.94	8.7	58.26	57.00
3	16.75	10.97	9.4	50.07	49.19	9.5	18.57	47.46	9.6	22.52	16.32	9.7	58.46	57.28
3	16.44	10.96	10.4	49.92	49.54	10.5	18.49	47.87	10.6	22.64	16.72	10.7	58.66	57.59
1.3	16.12	10.92	11.4	49.74	49.88	11.5	18.38	48.28	11.6	22.73	17.13	11.7	58.85	57.92
3	15.81	10.86	12.4	49.56	50.21	12.5	18.22	48.68	12.6	22.79	17.55	12.6	59.02	58.26
3	15.51	10.76	13.4	49.36	50.51	13.5	18.04	49.05	13.6	22.83	17.96	13.6	59.17	58.61
4.3	15.23	10.65	14.4	49.17	50.77	14.5	17.86	49.39	14.6	22.86	18.35	14.6	59.30	58.95
5.3	14.97	10.53	15.4	48.98	51.01	15.5	17.68	49.72	15.6	22.88	18.71	15.6	59.43	59.26
16.3	14.72	10.43	16.4	48.80	51.25	16.5	17.51	50.03	16.6	22.91	19.05	16.6	59.55	59.56
17.2	14.48	10.35	17.4	48.63	51.49	17.5	17.36	50.33	17.6	22.94	19.39	17.6	59.67	59.85
18.2	14.25	10.27	18.4	48.48	51.74	18.5	17.23	50.65	18.6	22.99	19.72	18.6	59.81	60.13
19.2	14.01	10.21	19.4	48.33	52.01	19.5	17.12	50.97	19.6	23.05	20.05	19.6	59.96	60.40
20.2	13.74	10.16	20.4	48.18	52.28	20.5	17.01	51.32	20.6	23.12	20.41	20.6	60.12	60.69
21.2	13.46	10.10	21.4	48.02	52.58	21.5	16.89	51.68	21.5	23.19	20.78	21.6	60.28	60.99
22.2	13.18	10.04	22.4	47.84	52.89	22.5	16.75	52.05	22.5	23.26	21.17	22.6	60.44	61.31
23.2	12.87	9.96	23.4	47.65	53.19	23.5	16.60	52.42	23.5	23.31	21.58	23.6	60.59	61.65
24.2	12.57	9.86	24.4	47.45	53.49	24.5	16.42	52.80	24.5	23.34	21.99	24.6	60.75	62.00
25.2	12.27	9.74	25.4	47.24	53.77	25.5	16.21	53.18	25.5	23.36	22.41	25.6	60.89	62.37
26.2	11.98	9.59	26.4	47.01	54.04	26.5	15.97	53.55	26.5	23.37	22.83	26.6	61.02	62.75
27.2	11.70	9.43	27.4	46.78	54.28	27.5	15.72	53.90	27.5	23.35	23.24	27.6	61.13	63.13
28.2	11.43	9.26	28.4	46.54	54.51	28.5	15.46	54.24	28.5	23.32	23.64	28.6	61.24	63.51
29.2	11.18	9.08	29.4	46.31	54.71	29.4	15.18	54.55	29.5	23.28	24.02	29.6	61.33	63.88
30.2	10.94	8.89	30.4	46.08	54.90	30.4	14.91	54.84	30.5	23.24	24.39	30.6	61.41	64.24
31.2	10.72	8.71	31.4	45.87	55.08	31.4	14.66	55.13	31.5	23.21	24.74	31.6	61.49	64.58
1.96 -11.92			11.10 -11.05			18.47 -18.45			12.26 -12.22			9.78 -9.73		
h 42 <sup>m</sup> 9 <sup>s</sup> .88			5 <sup>h</sup> 46 <sup>m</sup> 38 <sup>s</sup> .12			7 <sup>h</sup> 17 <sup>m</sup> 0 <sup>s</sup> .79			9 <sup>h</sup> 9 <sup>m</sup> 14 <sup>s</sup> .21			10 <sup>h</sup> 59 <sup>m</sup> 56 <sup>s</sup> .00		
° 11' 57".70			-84° 49' 49".43			-86° 53' 53".55			-85° 19' 28".08			-84° 8' 11".87		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

4 Octantis (G.). Mag. 5.6			31 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			γ Octantis. Mag. 6.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
Feb.	h m 1 42	° ' -85 12	Feb.	h m 5 46	° ' -84 49	Feb.	h m 7 17	° ' -86 53	Feb.	h m 9 9	° ' -85 19	Feb.	h m 11 0	° ' -84 8
	s "	"		s "	"		s "	"		s "	"		s "	"
0.2	10.72	8.71	0.4	45.87	55.08	0.4	14.66	55.13	0.5	23.21	24.74	0.6	1.49	4.58
1.2	10.49	8.54	1.4	45.66	55.27	1.4	14.42	55.40	1.5	23.18	25.09	1.6	1.57	4.90
2.2	10.25	8.39	2.4	45.45	55.46	2.4	14.19	55.68	2.5	23.17	25.43	2.6	1.67	5.23
3.2	10.01	8.26	3.4	45.25	55.67	3.4	13.98	55.99	3.5	23.17	25.79	3.6	1.78	5.56
4.2	9.75	8.13	4.4	45.05	55.90	4.4	13.77	56.32	4.5	23.16	26.17	4.6	1.90	5.90
5.2	9.47	7.99	5.4	44.84	56.15	5.4	13.54	56.66	5.5	23.16	26.58	5.6	2.02	6.26
6.2	9.18	7.83	6.4	44.60	56.41	6.4	13.28	57.02	6.5	23.15	27.00	6.6	2.14	6.65
7.2	8.89	7.64	7.4	44.34	56.66	7.4	12.99	57.39	7.5	23.12	27.43	7.6	2.25	7.07
8.2	8.59	7.42	8.4	44.07	56.88	8.4	12.66	57.74	8.5	23.06	27.87	8.6	2.34	7.50
9.2	8.31	7.17	9.4	43.78	57.07	9.4	12.31	58.07	9.5	22.98	28.30	9.6	2.42	7.93
10.2	8.06	6.91	10.4	43.49	57.24	10.4	11.95	58.37	10.5	22.88	28.71	10.6	2.47	8.35
11.2	7.83	6.64	11.4	43.21	57.38	11.4	11.59	58.65	11.5	22.77	29.10	11.6	2.51	8.75
12.2	7.61	6.38	12.3	42.96	57.50	12.4	11.23	58.90	12.5	22.66	29.47	12.6	2.54	9.14
13.2	7.41	6.13	13.3	42.72	57.62	13.4	10.90	59.14	13.5	22.57	29.82	13.6	2.58	9.51
14.2	7.21	5.90	14.3	42.48	57.75	14.4	10.58	59.38	14.5	22.48	30.15	14.6	2.62	9.86
15.2	7.00	5.68	15.3	42.24	57.88	15.4	10.29	59.62	15.5	22.41	30.48	15.6	2.67	10.21
16.2	6.79	5.47	16.3	42.01	58.04	16.4	10.00	59.89	16.5	22.35	30.82	16.6	2.73	10.57
17.2	6.56	5.27	17.3	41.77	58.20	17.4	9.71	60.18	17.5	22.29	31.18	17.6	2.80	10.93
18.2	6.32	5.07	18.3	41.53	58.38	18.4	9.41	60.47	18.5	22.23	31.56	18.5	2.88	11.31
19.2	6.07	4.86	19.3	41.28	58.56	19.4	9.10	60.76	19.5	22.16	31.96	19.5	2.94	11.70
20.2	5.82	4.63	20.3	41.01	58.73	20.4	8.76	61.06	20.5	22.07	32.36	20.5	3.01	12.11
21.2	5.57	4.37	21.3	40.73	58.89	21.4	8.40	61.36	21.5	21.98	32.76	21.5	3.07	12.53
22.1	5.32	4.10	22.3	40.45	59.04	22.4	8.02	61.65	22.5	21.87	33.16	22.5	3.11	12.95
23.1	5.08	3.81	23.3	40.16	59.17	23.4	7.61	61.92	23.5	21.73	33.56	23.5	3.13	13.38
24.1	4.87	3.50	24.3	39.86	59.27	24.4	7.19	62.17	24.5	21.58	33.94	24.5	3.14	13.81
25.1	4.66	3.18	25.3	39.55	59.35	25.4	6.77	62.40	25.5	21.42	34.30	25.5	3.14	14.23
26.1	4.47	2.86	26.3	39.26	59.41	26.4	6.35	62.61	26.4	21.26	34.64	26.5	3.13	14.64
27.1	4.29	2.55	27.3	38.99	59.46	27.4	5.94	62.81	27.4	21.09	34.97	27.5	3.11	15.02
28.1	4.13	2.25	28.3	38.72	59.51	28.4	5.55	62.99	28.4	20.93	35.29	28.5	3.10	15.39
29.1	3.96	1.97	29.3	38.46	59.56	29.4	5.17	63.18	29.4	20.79	35.61	29.5	3.10	15.75
30.1	3.79	1.69	30.3	38.21	59.63	30.4	4.82	63.38	30.4	20.66	35.93	30.5	3.10	16.11
31.1	3.60	1.43	31.3	37.96	59.71	31.4	4.47	63.60	31.4	20.55	36.26	31.5	3.12	16.48
11.95 -11.91			11.10 -11.06			18.49 -18.46			12.27 -12.23			9.79 -9.74		
1 <sup>h</sup> 42 <sup>m</sup> 9 <sup>s</sup> .88			5 <sup>h</sup> 46 <sup>m</sup> 38 <sup>s</sup> .12			7 <sup>h</sup> 17 <sup>m</sup> 0 <sup>s</sup> .79			9 <sup>h</sup> 9 <sup>m</sup> 14 <sup>s</sup> .21			10 <sup>h</sup> 59 <sup>m</sup> 56 <sup>s</sup> .00		
-85° 11' 57".70			-84° 49' 49".43			-86° 53' 53".55			-85° 19' 28".08			-84° 8' 11".87		

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

(G.). 6			31 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			η Octantis. Mag. 6.3		
Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.
° ' "		h m s	° ' "		h m s	° ' "		h m s	° ' "		h m s	° ' "		h m s
-85 11	Mar.	5 46	-84 49	Mar.	7 16	-86 54	Mar.	9 9	-85 19	Mar.	11 0	-84 8		
"		s	"		s	"		s	"		s	"		
62.25	0.3	38.72	59.51	0.4	65.55	2.99	0.4	20.93	35.29	0.5	3.10	15.39		
61.97	1.3	38.46	59.56	1.4	65.17	3.18	1.4	20.79	35.61	1.5	3.10	15.75		
61.69	2.3	38.21	59.63	2.4	64.82	3.38	2.4	20.66	35.93	2.5	3.10	16.11		
61.43	3.3	37.96	59.71	3.4	64.47	3.60	3.4	20.55	36.26	3.5	3.12	16.48		
61.17	4.3	37.70	59.82	4.4	64.11	3.83	4.4	20.44	36.62	4.5	3.15	16.86		
60.90	5.3	37.42	59.95	5.4	63.73	4.09	5.4	20.31	37.00	5.5	3.18	17.27		
60.61	6.3	37.12	60.06	6.3	63.33	4.35	6.4	20.17	37.38	6.5	3.20	17.70		
60.29	7.3	36.80	60.15	7.3	62.89	4.60	7.4	20.01	37.77	7.5	3.20	18.15		
59.94	8.3	36.48	60.23	8.3	62.42	4.84	8.4	19.83	38.16	8.5	3.19	18.59		
59.57	9.3	36.16	60.27	9.3	61.94	5.04	9.4	19.62	38.52	9.5	3.16	19.03		
59.19	10.3	35.85	60.28	10.3	61.45	5.21	10.4	19.40	38.86	10.5	3.11	19.45		
58.82	11.3	35.55	60.26	11.3	60.97	5.36	11.4	19.18	39.17	11.5	3.06	19.86		
58.46	12.3	35.26	60.24	12.3	60.52	5.50	12.4	18.97	39.47	12.5	3.00	20.24		
58.13	13.3	34.98	60.22	13.3	60.09	5.62	13.4	18.77	39.75	13.5	2.95	20.60		
57.80	14.3	34.72	60.21	14.3	59.67	5.75	14.4	18.59	40.03	14.5	2.91	20.95		
57.49	15.3	34.47	60.21	15.3	59.28	5.88	15.4	18.42	40.30	15.5	2.87	21.30		
57.19	16.3	34.20	60.23	16.3	58.89	6.04	16.4	18.25	40.58	16.5	2.84	21.65		
56.89	17.3	33.94	60.27	17.3	58.50	6.21	17.4	18.08	40.88	17.5	2.82	22.02		
56.59	18.3	33.67	60.31	18.3	58.09	6.38	18.4	17.92	41.20	18.5	2.80	22.40		
56.27	19.3	33.39	60.34	19.3	57.67	6.57	19.4	17.74	41.53	19.5	2.77	22.80		
55.92	20.2	33.10	60.37	20.3	57.22	6.75	20.4	17.55	41.86	20.5	2.74	23.20		
55.56	21.2	32.80	60.38	21.3	56.76	6.93	21.4	17.34	42.18	21.5	2.70	23.60		
55.19	22.2	32.50	60.37	22.3	56.28	7.08	22.4	17.12	42.50	22.5	2.64	24.01		
54.80	23.2	32.19	60.34	23.3	55.79	7.21	23.4	16.88	42.81	23.5	2.57	24.43		
54.41	24.2	31.88	60.29	24.3	55.29	7.32	24.4	16.63	43.10	24.5	2.48	24.83		
54.01	25.2	31.58	60.21	25.3	54.79	7.42	25.4	16.38	43.37	25.5	2.38	25.21		
53.62	26.2	31.29	60.12	26.3	54.30	7.49	26.4	16.13	43.61	26.4	2.28	25.57		
53.23	27.2	31.02	60.03	27.3	53.83	7.56	27.4	15.88	43.85	27.4	2.18	25.92		
52.86	28.2	30.75	59.94	28.3	53.38	7.62	28.4	15.64	44.07	28.4	2.08	26.26		
52.51	29.2	30.49	59.86	29.3	52.95	7.68	29.4	15.43	44.30	29.4	2.00	26.58		
52.18	30.2	30.24	59.80	30.3	52.53	7.76	30.4	15.22	44.53	30.4	1.93	26.91		
51.86	31.2	29.99	59.76	31.3	52.12	7.86	31.4	15.02	44.79	31.4	1.87	27.25		
-11.91	11.10	-11.06	18.50	-18.47	12.28	-12.24	9.79	-9.74						
9 <sup>s</sup> .88	5 <sup>h</sup> 46 <sup>m</sup>	38 <sup>s</sup> .12	7 <sup>h</sup> 17 <sup>m</sup>	0 <sup>s</sup> .79	9 <sup>h</sup> 9 <sup>m</sup>	14 <sup>s</sup> .21	10 <sup>h</sup> 59 <sup>m</sup>	56 <sup>s</sup> .00						
57'' .70	-84° 49'	49'' .43	-86° 53'	53'' .55	-85° 19'	28'' .08	-84° 8'	11'' .87						



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

4 Octantis (G.). Mag. 5.6			81 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			5 Octantis. Mag. 5.4			7 Octanti Mag. 6.3	
Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.
	h m	° '		h m	° '		h m	° '		h m	° '		h m
Apr.	1 41	-85 11	Apr.	5 46	-84 49	Apr.	7 16	-86 54	Apr.	9 9	-85 19	Apr.	10 59
	s	"		s	"		s	"		s	"		s
0.0	59.52	51.86	0.2	29.99	59.76	0.3	52.12	7.86	0.4	15.02	44.79	0.4	61.87
1.0	59.41	51.53	1.2	29.72	59.74	1.3	51.69	7.98	1.4	14.81	45.06	1.4	61.81
2.0	59.28	51.17	2.2	29.44	59.71	2.3	51.23	8.11	2.4	14.60	45.35	2.4	61.75
3.0	59.16	50.80	3.2	29.14	59.68	3.3	50.76	8.23	3.4	14.37	45.64	3.4	61.67
4.0	59.03	50.40	4.2	28.84	59.62	4.3	50.25	8.33	4.3	14.12	45.93	4.4	61.58
5.0	58.93	49.98	5.2	28.53	59.53	5.3	49.72	8.42	5.3	13.84	46.21	5.4	61.47
6.0	58.86	49.55	6.2	28.22	59.42	6.3	49.19	8.47	6.3	13.55	46.46	6.4	61.35
7.0	58.81	49.13	7.2	27.92	59.28	7.3	48.67	8.50	7.3	13.26	46.67	7.4	61.21
8.0	58.76	48.71	8.2	27.64	59.12	8.3	48.17	8.50	8.3	12.98	46.86	8.4	61.06
9.0	58.73	48.32	9.2	27.38	58.96	9.3	47.70	8.49	9.3	12.71	47.03	9.4	60.93
10.0	58.72	47.94	10.2	27.14	58.81	10.3	47.24	8.48	10.3	12.45	47.19	10.4	60.80
11.0	58.69	47.59	11.2	26.90	58.67	11.3	46.82	8.48	11.3	12.20	47.35	11.4	60.68
12.0	58.66	47.25	12.2	26.67	58.55	12.2	46.41	8.49	12.3	11.97	47.52	12.4	60.57
13.0	58.61	46.90	13.2	26.43	58.44	13.2	45.99	8.52	13.3	11.74	47.71	13.4	60.47
14.0	58.56	46.56	14.2	26.20	58.34	14.2	45.57	8.56	14.3	11.51	47.91	14.4	60.38
15.0	58.49	46.21	15.2	25.95	58.24	15.2	45.14	8.60	15.3	11.28	48.12	15.4	60.28
16.0	58.43	45.86	16.2	25.68	58.14	16.2	44.69	8.65	16.3	11.03	48.33	16.4	60.17
17.0	58.37	45.48	17.2	25.42	58.02	17.2	44.23	8.69	17.3	10.77	48.54	17.4	60.06
17.9	58.32	45.08	18.2	25.16	57.89	18.2	43.74	8.72	18.3	10.50	48.74	18.4	59.93
18.9	58.28	44.67	19.2	24.89	57.74	19.2	43.25	8.72	19.3	10.22	48.93	19.4	59.79
19.9	58.26	44.27	20.2	24.62	57.56	20.2	42.75	8.69	20.3	9.92	49.11	20.4	59.64
20.9	58.26	43.85	21.2	24.34	57.36	21.2	42.25	8.66	21.3	9.62	49.26	21.4	59.47
21.9	58.28	43.43	22.2	24.09	57.15	22.2	41.76	8.60	22.3	9.31	49.39	22.4	59.30
22.9	58.30	43.02	23.2	23.86	56.94	23.2	41.29	8.53	23.3	9.01	49.51	23.4	59.13
23.9	58.33	42.63	24.2	23.63	56.72	24.2	40.85	8.45	24.3	8.72	49.61	24.4	58.96
24.9	58.36	42.27	25.1	23.41	56.51	25.2	40.42	8.36	25.3	8.46	49.69	25.4	58.81
25.9	58.39	41.92	26.1	23.21	56.32	26.2	40.01	8.30	26.3	8.20	49.79	26.4	58.66
26.9	58.41	41.58	27.1	23.01	56.15	27.2	39.61	8.26	27.3	7.96	49.91	27.4	58.51
27.9	58.41	41.25	28.1	22.80	56.00	28.2	39.20	8.22	28.3	7.72	50.04	28.4	58.41
28.9	58.40	40.91	29.1	22.57	55.85	29.2	38.79	8.21	29.3	7.48	50.19	29.4	58.28
29.9	58.38	40.54	30.1	22.34	55.69	30.2	38.35	8.21	30.3	7.21	50.35	30.4	58.11
30.9	58.37	40.15	31.1	22.08	55.51	31.2	37.88	8.18	31.3	6.93	50.52	31.4	58.01
11.94	-11.90		11.10	-11.06		18.51	-18.48		12.28	-12.24		9.80	
1 <sup>h</sup> 42 <sup>m</sup>	9 <sup>s</sup> .88		5 <sup>h</sup> 46 <sup>m</sup>	38 <sup>s</sup> .12		7 <sup>h</sup> 17 <sup>m</sup>	0 <sup>s</sup> .79		9 <sup>h</sup> 9 <sup>m</sup>	14 <sup>s</sup> .21		10 <sup>h</sup> 59 <sup>m</sup>	
-85° 11'	57'' .70		-84° 49'	49'' .43		-86° 53'	53'' .55		-85° 19'	28'' .08		-84° 8'	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Octantis (G.). Mag. 5.6			31 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			η Octantis. Mag. 6.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
May 1 41 s	h m 58.37 s	° ' -85 11 "	May 5 46 s	h m 22.08 s	° ' -84 49 "	May 7 16 s	h m 37.88 s	° ' -86 54 "	May 9 8 s	h m 66.93 s	° ' -85 19 "	May 10 59 s	h m 58.00 s	° ' -84 8 "
1.1	58.37	40.15	1.1	22.08	55.51	1.2	37.88	8.18	1.3	66.93	50.52	1.4	58.00	36.95
2.1	58.36	39.74	2.1	21.82	55.32	2.2	37.39	8.14	2.3	66.63	50.67	2.3	57.84	37.25
3.1	58.38	39.31	3.1	21.57	55.11	3.2	36.89	8.07	3.3	66.32	50.80	3.3	57.66	37.54
4.1	58.43	38.89	4.1	21.33	54.85	4.2	36.40	7.97	4.3	65.99	50.89	4.3	57.46	37.81
5.1	58.49	38.47	5.1	21.10	54.58	5.2	35.93	7.84	5.3	65.67	50.95	5.3	57.26	38.05
6.1	58.58	38.07	6.1	20.90	54.30	6.2	35.48	7.70	6.3	65.36	51.00	6.3	57.06	38.26
7.1	58.68	37.70	7.1	20.71	54.03	7.2	35.06	7.55	7.3	65.08	51.03	7.3	56.87	38.45
8.1	58.77	37.36	8.1	20.54	53.77	8.2	34.68	7.41	8.3	64.81	51.05	8.3	56.68	38.63
9.1	58.85	37.04	9.1	20.38	53.53	9.2	34.31	7.29	9.3	64.55	51.08	9.3	56.52	38.81
10.1	58.92	36.73	10.1	20.21	53.31	10.2	33.96	7.18	10.2	64.30	51.12	10.3	56.37	38.98
11.1	58.98	36.41	11.1	20.05	53.10	11.2	33.60	7.08	11.2	64.06	51.17	11.3	56.22	39.17
12.1	59.02	36.09	12.1	19.87	52.89	12.2	33.23	6.98	12.2	63.81	51.24	12.3	56.07	39.37
13.1	59.06	35.76	13.1	19.69	52.68	13.2	32.85	6.89	13.2	63.56	51.30	13.3	55.92	39.57
14.1	59.12	35.42	14.1	19.50	52.47	14.2	32.45	6.80	14.2	63.29	51.38	14.3	55.76	39.79
15.1	59.17	35.07	15.1	19.31	52.25	15.2	32.03	6.70	15.2	63.01	51.44	15.3	55.59	40.00
16.1	59.24	34.70	16.1	19.12	52.00	16.2	31.62	6.58	16.2	62.72	51.49	16.3	55.40	40.21
17.1	59.33	34.33	17.1	18.93	51.73	17.2	31.19	6.44	17.2	62.43	51.53	17.3	55.21	40.42
18.1	59.42	33.95	18.1	18.74	51.44	18.1	30.77	6.28	18.2	62.12	51.54	18.3	55.00	40.61
19.1	59.54	33.57	19.1	18.56	51.13	19.1	30.35	6.10	19.2	61.82	51.53	19.3	54.79	40.78
20.1	59.66	33.20	20.1	18.40	50.82	20.1	29.95	5.90	20.2	61.51	51.50	20.3	54.57	40.93
21.1	59.81	32.86	21.1	18.24	50.51	21.1	29.58	5.70	21.2	61.22	51.46	21.3	54.36	41.06
22.1	59.96	32.54	22.1	18.11	50.20	22.1	29.23	5.49	22.2	60.95	51.41	22.3	54.15	41.17
23.1	60.09	32.23	23.1	17.99	49.90	23.1	28.91	5.29	23.2	60.69	51.36	23.3	53.96	41.28
24.1	60.23	31.94	24.1	17.87	49.63	24.1	28.60	5.11	24.2	60.45	51.32	24.3	53.78	41.38
25.1	60.34	31.66	25.1	17.76	49.38	25.1	28.29	4.95	25.2	60.22	51.30	25.3	53.62	41.50
26.1	60.44	31.38	26.1	17.62	49.14	26.1	27.98	4.81	26.2	59.98	51.30	26.3	53.46	41.63
27.1	60.53	31.08	27.1	17.48	48.90	27.1	27.64	4.68	27.2	59.73	51.31	27.3	53.29	41.78
28.1	60.61	30.76	28.1	17.32	48.65	28.1	27.28	4.54	28.2	59.47	51.32	28.3	53.11	41.95
29.1	60.70	30.43	29.1	17.15	48.39	29.1	26.89	4.38	29.2	59.19	51.33	29.3	52.92	42.11
30.1	60.82	30.07	30.1	16.99	48.10	30.1	26.49	4.20	30.2	58.89	51.33	30.3	52.72	42.27
31.1	60.96	29.70	31.1	16.84	47.77	31.1	26.10	3.99	31.2	58.59	51.30	31.3	52.50	42.41
32.0	61.12	29.34	32.0	16.70	47.43	32.1	25.73	3.75	32.2	58.28	51.23	32.3	52.27	42.52
11.10	-11.89	11.10	-11.05	18.50	-18.48	12.29	-12.24	9.80	-9.75					
42 <sup>m</sup> 9 <sup>s</sup> .88	5 <sup>h</sup> 46 <sup>m</sup> 38 <sup>s</sup> .12	7 <sup>h</sup> 17 <sup>m</sup> 0 <sup>s</sup> .79	9 <sup>h</sup> 9 <sup>m</sup> 14 <sup>s</sup> .21	10 <sup>h</sup> 59 <sup>m</sup> 56 <sup>s</sup> .00										
11'	57''.70	-84° 49'	49''.43	-86° 53'	53''.55	-85° 19'	28''.08	-84° 8'	11''.87					

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

4 Octantis (G.). Mag. 5.6			31 Mensae (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			5 Octantis. Mag. 5.4			7 Octantis. Mag. 6.3		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
June	h m 1 42	° ' -85 11	June	h m 5 46	° ' -84 49	June	h m 7 16	° ' -86 53	June	h m 9 8	° ' -85 19	June	h m 10 59	° ' -84 8
	s "	"		s "	"		s "	"		s "	"		s "	"
0.9	1.12	29.34	1.0	16.70	47.43	1.1	25.73	63.75	1.2	58.28	51.23	1.3	52.27	42.52
1.9	1.30	29.01	2.0	16.58	47.08	2.1	25.38	63.50	2.2	57.99	51.13	2.3	52.04	42.60
2.9	1.49	28.72	3.0	16.48	46.73	3.1	25.07	63.24	3.2	57.72	51.02	3.3	51.82	42.67
3.9	1.68	28.44	4.0	16.40	46.39	4.1	24.78	62.98	4.2	57.46	50.90	4.3	51.61	42.71
4.9	1.86	28.18	5.0	16.33	46.08	5.1	24.53	62.73	5.2	57.23	50.78	5.3	51.42	42.74
5.9	2.03	27.94	6.0	16.26	45.78	6.1	24.29	62.50	6.2	57.01	50.67	6.3	51.24	42.77
6.9	2.19	27.70	7.0	16.20	45.50	7.1	24.05	62.29	7.2	56.80	50.57	7.3	51.06	42.81
7.9	2.33	27.47	8.0	16.13	45.23	8.1	23.81	62.08	8.2	56.58	50.49	8.3	50.90	42.86
8.9	2.48	27.23	9.0	16.05	44.96	9.1	23.56	61.88	9.2	56.36	50.41	9.3	50.73	42.91
9.9	2.62	26.98	10.0	15.96	44.69	10.1	23.30	61.68	10.2	56.13	50.33	10.3	50.55	42.96
10.9	2.77	26.72	11.0	15.87	44.41	11.1	23.02	61.48	11.2	55.89	50.26	11.3	50.37	43.04
11.8	2.92	26.45	12.0	15.78	44.11	12.1	22.74	61.26	12.2	55.65	50.18	12.3	50.18	43.11
12.8	3.10	26.18	13.0	15.69	43.79	13.1	22.45	61.02	13.2	55.39	50.08	13.3	49.97	43.17
13.8	3.28	25.89	14.0	15.60	43.46	14.1	22.15	60.76	14.2	55.13	49.96	14.3	49.76	43.21
14.8	3.48	25.60	15.0	15.52	43.11	15.1	21.87	60.49	15.2	54.87	49.82	15.3	49.53	43.23
15.8	3.70	25.33	16.0	15.46	42.75	16.1	21.61	60.20	16.2	54.61	49.66	16.3	49.30	43.24
16.8	3.92	25.08	17.0	15.41	42.39	17.1	21.37	59.89	17.2	54.36	49.49	17.3	49.09	43.23
17.8	4.15	24.85	18.0	15.38	42.03	18.1	21.15	59.59	18.2	54.12	49.30	18.3	48.87	43.20
18.8	4.38	24.64	18.9	15.37	41.68	19.1	20.97	59.29	19.2	53.91	49.10	19.3	48.66	43.16
19.8	4.60	24.46	19.9	15.36	41.36	20.1	20.81	59.01	20.2	53.72	48.91	20.3	48.48	43.11
20.8	4.80	24.29	20.9	15.34	41.07	21.1	20.65	58.75	21.2	53.54	48.75	21.3	48.31	43.07
21.8	4.98	24.12	21.9	15.33	40.79	22.1	20.49	58.51	22.2	53.35	48.60	22.3	48.15	43.04
22.8	5.15	23.94	22.9	15.30	40.52	23.1	20.32	58.29	23.2	53.17	48.46	23.3	47.98	43.00
23.8	5.32	23.74	23.9	15.27	40.25	24.0	20.12	58.07	24.1	52.98	48.34	24.2	47.82	43.03
24.8	5.48	23.52	24.9	15.21	39.97	25.0	19.91	57.83	25.1	52.76	48.22	25.2	47.64	43.06
25.8	5.66	23.28	25.9	15.16	39.65	26.0	19.68	57.58	26.1	52.53	48.09	26.2	47.44	43.07
26.8	5.87	23.03	26.9	15.12	39.31	27.0	19.44	57.31	27.1	52.29	47.94	27.2	47.23	43.07
27.8	6.10	22.80	27.9	15.08	38.95	28.0	19.22	57.01	28.1	52.05	47.75	28.2	47.01	43.04
28.8	6.34	22.58	28.9	15.06	38.58	29.0	19.01	56.68	29.1	51.82	47.53	29.2	46.79	42.98
29.8	6.60	22.39	29.9	15.07	38.21	30.0	18.85	56.34	30.1	51.61	47.30	30.2	46.57	42.99
30.8	6.87	22.22	30.9	15.09	37.86	31.0	18.72	56.00	31.1	51.41	47.06	31.2	46.37	42.89
31.8	7.12	22.08	31.9	15.13	37.52	32.0	18.63	55.67	32.1	51.24	46.81	32.2	46.18	42.68
11.93	-11.88		11.09	-11.05		18.49	-18.46		12.28	-12.24		9.80	-9.75	
1 <sup>h</sup> 42 <sup>m</sup>	9 <sup>s</sup> .88		5 <sup>h</sup> 46 <sup>m</sup>	38 <sup>s</sup> .12		7 <sup>h</sup> 17 <sup>m</sup>	0 <sup>s</sup> .79		9 <sup>h</sup> 9 <sup>m</sup>	14 <sup>s</sup> .21		10 <sup>h</sup> 59 <sup>m</sup>	56 <sup>s</sup> .00	
-85° 11'	57'' .70		-84° 49'	49'' .43		-86° 53'	53'' .55		-85° 19'	28'' .08		-84° 8'	11'' .87	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

Octantis (G.). Mag. 5.6			81 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			η Octantis. Mag. 6.3			
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	
h m	° ' "	h m	h m	° ' "	h m	h m	° ' "	h m	h m	° ' "	h m	h m	° ' "	h m	° ' "
July 1	42	85 11	July 5	46	84 49	July 7	16	86 53	July 9	8	85 19	July 10	59	84 8	
0.8	6.87	22.22	0.9	15.09	37.86	1.0	18.72	56.00	1.1	51.41	47.06	1.2	46.37	42.80	
1.8	7.12	22.08	1.9	15.13	37.52	2.0	18.63	55.67	2.1	51.24	46.81	2.2	46.18	42.68	
2.8	7.37	21.96	2.9	15.17	37.20	3.0	18.55	55.36	3.1	51.09	46.57	3.2	46.01	42.55	
3.8	7.60	21.85	3.9	15.22	36.89	4.0	18.48	55.08	4.1	50.94	46.35	4.2	45.84	42.43	
4.8	7.82	21.74	4.9	15.27	36.61	5.0	18.42	54.80	5.1	50.81	46.13	5.2	45.69	42.33	
5.8	8.04	21.64	5.9	15.31	36.34	6.0	18.35	54.53	6.1	50.67	45.93	6.2	45.53	42.23	
6.8	8.24	21.52	6.9	15.33	36.06	7.0	18.26	54.28	7.1	50.53	45.74	7.2	45.38	42.14	
7.8	8.45	21.39	7.9	15.36	35.78	8.0	18.16	54.02	8.1	50.37	45.55	8.2	45.21	42.05	
8.8	8.66	21.26	8.9	15.39	35.49	9.0	18.05	53.76	9.1	50.21	45.35	9.2	45.04	41.97	
9.8	8.87	21.13	9.9	15.41	35.18	10.0	17.94	53.47	10.1	50.04	45.13	10.2	44.86	41.89	
10.8	9.11	20.99	10.9	15.44	34.87	11.0	17.83	53.16	11.1	49.86	44.91	11.2	44.68	41.80	
11.8	9.35	20.85	11.9	15.46	34.54	11.9	17.72	52.84	12.1	49.68	44.66	12.2	44.48	41.68	
12.8	9.61	20.71	12.9	15.51	34.19	12.9	17.62	52.51	13.1	49.51	44.40	13.2	44.29	41.55	
13.8	9.88	20.59	13.9	15.58	33.83	13.9	17.56	52.17	14.1	49.35	44.12	14.1	44.09	41.40	
14.8	10.16	20.49	14.9	15.66	33.49	14.9	17.53	51.81	15.1	49.20	43.83	15.1	43.90	41.23	
15.8	10.44	20.42	15.9	15.76	33.16	15.9	17.51	51.47	16.1	49.07	43.53	16.1	43.72	41.04	
16.8	10.71	20.37	16.9	15.85	32.86	16.9	17.52	51.14	17.1	48.96	43.23	17.1	43.56	40.84	
17.8	10.96	20.34	17.9	15.95	32.57	17.9	17.55	50.84	18.1	48.86	42.95	18.1	43.42	40.65	
18.7	11.19	20.32	18.9	16.06	32.31	18.9	17.58	50.55	19.1	48.78	42.70	19.1	43.29	40.47	
19.7	11.42	20.30	19.9	16.15	32.07	19.9	17.60	50.28	20.1	48.70	42.47	20.1	43.16	40.31	
20.7	11.62	20.26	20.9	16.23	31.83	20.9	17.61	50.03	21.1	48.61	42.24	21.1	43.04	40.16	
21.7	11.83	20.20	21.9	16.29	31.58	21.9	17.60	49.78	22.0	48.50	42.02	22.1	42.91	40.03	
22.7	12.03	20.13	22.9	16.35	31.31	22.9	17.56	49.52	23.0	48.38	41.80	23.1	42.76	39.91	
23.7	12.25	20.04	23.9	16.42	31.02	23.9	17.51	49.22	24.0	48.25	41.56	24.1	42.60	39.77	
24.7	12.50	19.95	24.9	16.49	30.71	24.9	17.48	48.90	25.0	48.12	41.29	25.1	42.43	39.62	
25.7	12.77	19.87	25.9	16.57	30.39	25.9	17.46	48.57	26.0	47.98	40.99	26.1	42.25	39.44	
26.7	13.05	19.82	26.9	16.68	30.06	26.9	17.47	48.22	27.0	47.86	40.67	27.1	42.07	39.23	
27.7	13.33	19.81	27.9	16.81	29.75	27.9	17.53	47.87	28.0	47.77	40.35	28.1	41.91	39.00	
28.7	13.62	19.81	28.9	16.95	29.45	28.9	17.60	47.53	29.0	47.69	40.02	29.1	41.76	38.75	
29.7	13.90	19.84	29.9	17.11	29.19	29.9	17.71	47.21	30.0	47.64	39.70	30.1	41.64	38.50	
30.7	14.15	19.88	30.9	17.27	28.94	30.9	17.83	46.91	31.0	47.61	39.39	31.1	41.52	38.25	
31.7	14.39	19.93	31.9	17.42	28.71	31.9	17.96	46.63	32.0	47.57	39.10	32.1	41.42	38.01	
1.92      -11.88			11.09      -11.04			18.48      -18.45			12.28      -12.24			9.80      -9.75			
h 42 <sup>m</sup> 9 <sup>s</sup> .88			5 <sup>h</sup> 46 <sup>m</sup> 38 <sup>s</sup> .12			7 <sup>h</sup> 17 <sup>m</sup> 0 <sup>s</sup> .79			9 <sup>h</sup> 9 <sup>m</sup> 14 <sup>s</sup> .21			10 <sup>h</sup> 59 <sup>m</sup> 56 <sup>s</sup> .00			
° 11'      57'' .70			-84° 49'      49'' .43			-86° 53'      53'' .55			-85° 19'      28'' .08			-84° 8'      11'' .87			

[Eph 13]

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

4 Octantis (G.). Mag. 5.6			31 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			η Octantis. Mag. 6.3	
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.
Aug.	h m 1 42	° ' 85 11	Aug.	h m 5 46	° ' 84 49	Aug.	h m 7 16	° ' 86 53	Aug.	h m 9 8	° ' 85 19	Aug.	h m 10 59
	s "			s "			s "			s "			s "
0.7	14.39	19.93	0.9	17.42	28.71	0.9	17.96	46.63	1.0	47.57	39.10	1.1	41.42
1.7	14.60	19.99	1.9	17.56	28.50	1.9	18.08	46.37	2.0	47.54	38.83	2.1	41.32
2.7	14.82	20.03	2.9	17.69	28.29	2.9	18.19	46.11	3.0	47.51	38.57	3.1	41.22
3.7	15.03	20.08	3.9	17.82	28.07	3.9	18.29	45.85	4.0	47.48	38.30	4.1	41.12
4.7	15.25	20.11	4.9	17.96	27.85	4.9	18.38	45.59	5.0	47.43	38.03	5.1	41.01
5.7	15.47	20.13	5.9	18.08	27.62	5.9	18.46	45.33	6.0	47.38	37.77	6.1	40.90
6.7	15.71	20.14	6.9	18.20	27.37	6.9	18.54	45.05	7.0	47.31	37.49	7.1	40.78
7.7	15.95	20.16	7.9	18.33	27.12	7.9	18.62	44.74	8.0	47.26	37.19	8.1	40.65
8.7	16.20	20.18	8.9	18.48	26.86	8.9	18.71	44.43	9.0	47.19	36.88	9.1	40.52
9.7	16.46	20.22	9.9	18.64	26.60	9.9	18.83	44.11	9.9	47.15	36.55	10.1	40.30
10.7	16.73	20.27	10.9	18.80	26.33	10.9	18.97	43.79	10.9	47.11	36.20	11.1	40.27
11.7	17.00	20.34	11.9	18.99	26.08	11.9	19.13	43.47	11.9	47.10	35.86	12.1	40.16
12.7	17.27	20.44	12.9	19.19	25.85	12.9	19.33	43.16	12.9	47.10	35.52	13.1	40.06
13.7	17.52	20.57	13.8	19.39	25.64	13.9	19.54	42.88	13.9	47.12	35.19	14.1	39.98
14.7	17.74	20.71	14.8	19.59	25.47	14.9	19.77	42.62	14.9	47.16	34.88	15.1	39.92
15.7	17.95	20.85	15.8	19.78	25.32	15.9	19.99	42.39	15.9	47.20	34.59	16.1	39.87
16.7	18.15	20.98	16.8	19.95	25.19	16.9	20.19	42.17	16.9	47.24	34.32	17.1	39.82
17.7	18.33	21.10	17.8	20.12	25.04	17.9	20.37	41.97	17.9	47.27	34.07	18.1	39.77
18.7	18.52	21.19	18.8	20.27	24.89	18.9	20.53	41.76	18.9	47.29	33.82	19.0	39.71
19.7	18.71	21.26	19.8	20.42	24.72	19.9	20.67	41.52	19.9	47.29	33.56	20.0	39.63
20.7	18.93	21.34	20.8	20.57	24.52	20.9	20.81	41.26	20.9	47.28	33.28	21.0	39.53
21.7	19.16	21.42	21.8	20.74	24.30	21.9	20.98	40.98	21.9	47.27	32.98	22.0	39.44
22.7	19.40	21.52	22.8	20.93	24.08	22.9	21.16	40.69	22.9	47.26	32.65	23.0	39.35
23.7	19.64	21.64	23.8	21.14	23.87	23.9	21.38	40.40	23.9	47.28	32.32	24.0	39.26
24.6	19.90	21.79	24.8	21.35	23.68	24.9	21.63	40.12	24.9	47.33	31.98	25.0	39.19
25.6	20.14	21.97	25.8	21.58	23.52	25.9	21.91	39.85	25.9	47.40	31.64	26.0	39.15
26.6	20.35	22.17	26.8	21.81	23.38	26.9	22.20	39.61	26.9	47.48	31.31	27.0	39.11
27.6	20.55	22.37	27.8	22.05	23.26	27.9	22.50	39.40	27.9	47.58	31.00	28.0	39.09
28.6	20.74	22.58	28.8	22.28	23.17	28.9	22.80	39.20	28.9	47.69	30.72	29.0	39.08
29.6	20.91	22.78	29.8	22.49	23.08	29.9	23.09	39.02	29.9	47.79	30.46	30.0	39.08
30.6	21.08	22.98	30.8	22.71	23.00	30.9	23.36	38.83	30.9	47.89	30.20	31.0	39.07
31.6	21.24	23.17	31.8	22.91	22.91	31.9	23.62	38.66	31.9	47.97	29.95	32.0	39.05
11.92	-11.88		11.08	-11.04		18.46	-18.44		12.27	-12.23		9.80	
1 <sup>h</sup> 42 <sup>m</sup>	9 <sup>s</sup> .88		5 <sup>h</sup> 46 <sup>m</sup>	38 <sup>s</sup> .12		7 <sup>h</sup> 17 <sup>m</sup>	0 <sup>s</sup> .79		9 <sup>h</sup> 9 <sup>m</sup>	14 <sup>s</sup> .21		10 <sup>h</sup> 59 <sup>m</sup>	
-85° 11'	57'' .70		-84° 49'	49'' .43		-86° 53'	53'' .55		-85° 19'	28'' .08		-84° 8'	

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

α <sup>1</sup> (G.). 3. 5.6		81 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			ζ Octantis. Mag. 5.4			η Octantis. Mag. 6.3		
Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
h m s	° '	Sept.	h m s	° '	Sept.	h m s	° '	Sept.	h m s	° '	Sept.	h m s	° '
42	85 11		5 46	84 49		7 16	86 53		9 8	85 19		10 59	84 8
.24	23.17	0.8	22.91	22.91	0.9	23.62	38.66	0.9	47.97	29.95	1.0	39.05	29.75
.41	23.34	1.8	23.10	22.82	1.9	23.88	38.48	1.9	48.05	29.69	2.0	39.04	29.48
.58	23.51	2.8	23.30	22.71	2.9	24.13	38.29	2.9	48.12	29.42	3.0	39.01	29.21
.76	23.68	3.8	23.50	22.60	3.9	24.38	38.08	3.9	48.20	29.14	4.0	38.98	28.93
.95	23.85	4.8	23.69	22.48	4.9	24.63	37.87	4.9	48.27	28.85	5.0	38.94	28.63
.16	24.02	5.8	23.90	22.34	5.8	24.90	37.64	5.9	48.34	28.55	6.0	38.90	28.33
.37	24.21	6.8	24.13	22.22	6.8	25.18	37.41	6.9	48.42	28.24	6.9	38.88	28.01
.58	24.42	7.8	24.36	22.11	7.8	25.50	37.18	7.9	48.52	27.92	7.9	38.86	27.68
.78	24.66	8.8	24.61	22.01	8.8	25.84	36.97	8.9	48.65	27.61	8.9	38.85	27.34
.96	24.91	9.8	24.87	21.94	9.8	26.20	36.79	9.9	48.80	27.31	9.9	38.87	26.99
.12	25.18	10.8	25.12	21.90	10.8	26.58	36.63	10.9	48.96	27.03	10.9	38.90	26.65
.27	25.47	11.8	25.37	21.89	11.8	26.94	36.50	11.9	49.13	26.77	11.9	38.95	26.34
.39	25.74	12.8	25.60	21.90	12.8	27.30	36.39	12.9	49.30	26.54	12.9	39.00	26.05
.50	25.98	13.8	25.82	21.90	13.8	27.63	36.29	13.9	49.46	26.33	13.9	39.05	25.77
.61	26.22	14.8	26.02	21.91	14.8	27.94	36.19	14.9	49.60	26.13	14.9	39.09	25.51
.72	26.44	15.8	26.22	21.90	15.8	28.23	36.08	15.9	49.72	25.93	15.9	39.12	25.26
.84	26.64	16.8	26.41	21.87	16.8	28.51	35.95	16.9	49.84	25.71	16.9	39.13	25.01
.97	26.85	17.8	26.61	21.82	17.8	28.80	35.80	17.9	49.95	25.48	17.9	39.14	24.74
.12	27.06	18.8	26.83	21.76	18.8	29.10	35.63	18.9	50.07	25.22	18.9	39.15	24.44
.29	27.29	19.7	27.07	21.71	19.8	29.44	35.46	19.9	50.21	24.95	19.9	39.17	24.13
.45	27.56	20.7	27.32	21.67	20.8	29.80	35.30	20.9	50.37	24.67	20.9	39.20	23.79
.60	27.85	21.7	27.58	21.65	21.8	30.19	35.15	21.9	50.55	24.39	21.9	39.24	23.45
.74	28.15	22.7	27.84	21.67	22.8	30.60	35.04	22.9	50.75	24.13	22.9	39.31	23.12
.85	28.47	23.7	28.10	21.71	23.8	31.02	34.95	23.9	50.96	23.89	23.9	39.39	22.80
.94	28.80	24.7	28.36	21.78	24.8	31.44	34.88	24.9	51.18	23.68	24.9	39.49	22.48
.01	29.12	25.7	28.60	21.86	25.8	31.85	34.83	25.9	51.40	23.49	25.9	39.58	22.19
.08	29.44	26.7	28.83	21.94	26.8	32.23	34.79	26.9	51.61	23.31	26.9	39.68	21.91
.15	29.74	27.7	29.05	22.02	27.8	32.60	34.75	27.9	51.81	23.14	27.9	39.78	21.65
.21	30.02	28.7	29.27	22.10	28.8	32.96	34.72	28.9	52.01	22.97	28.9	39.86	21.40
.27	30.28	29.7	29.48	22.16	29.8	33.32	34.67	29.9	52.20	22.81	29.9	39.95	21.15
.35	30.55	30.7	29.68	22.22	30.8	33.66	34.62	30.9	52.39	22.63	30.9	40.03	20.89
.43	30.82	31.7	29.89	22.27	31.8	34.00	34.55	31.9	52.57	22.44	31.9	40.10	20.63
-11.89		11.08 -11.04			18.45 -18.42			12.27 -12.23			9.80 -9.74		
9 <sup>s</sup> .88		5 <sup>h</sup> 46 <sup>m</sup> 38 <sup>s</sup> .12			7 <sup>h</sup> 17 <sup>m</sup> 0 <sup>s</sup> .79			9 <sup>h</sup> 9 <sup>m</sup> 14 <sup>s</sup> .21			10 <sup>h</sup> 59 <sup>m</sup> 56 <sup>s</sup> .00		
57 <sup>''</sup> .70		-84° 49' 49 <sup>''</sup> .43			-86° 53' 53 <sup>''</sup> .55			-85° 19' 28 <sup>''</sup> .08			-84° 8' 11 <sup>''</sup> .87		

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT W .



APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

Octantis (G.). Mag. 5.6			31 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			5 Octantis. Mag. 5.4			7 Octantis. Mag. 6.3			
Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	
h m	° ' "	h m	° ' "	h m	° ' "	h m	° ' "	h m	h m	° ' "	h m	h m	° ' "	h m	° ' "
Nov. 1 42	85 11	Nov. 5 46	84 49	Nov. 7 16	86 53	Nov. 9 8	85 19	Nov. 10 59	84 8						
5 25.47	40.14	0.6	35.99	27.08	0.7	45.48	35.96	0.8	59.89	19.44	0.8	44.40	14.03		
5 25.43	40.45	1.6	36.18	27.30	1.7	45.85	36.06	1.8	60.15	19.40	1.8	44.57	13.84		
5 25.38	40.78	2.6	36.36	27.53	2.7	46.24	36.18	2.8	60.43	19.36	2.8	44.76	13.66		
5 25.31	41.11	3.6	36.55	27.79	3.7	46.64	36.33	3.8	60.73	19.35	3.8	44.96	13.48		
5 25.22	41.45	4.6	36.73	28.07	4.7	47.04	36.50	4.8	61.03	19.36	4.8	45.18	13.33		
4 25.11	41.80	5.6	36.90	28.37	5.7	47.43	36.69	5.8	61.34	19.39	5.8	45.41	13.20		
4 24.98	42.13	6.6	37.04	28.69	6.7	47.79	36.92	6.8	61.64	19.45	6.8	45.64	13.10		
4 24.83	42.42	7.6	37.17	29.01	7.7	48.12	37.16	7.8	61.92	19.54	7.8	45.86	13.02		
4 24.68	42.69	8.6	37.28	29.32	8.7	48.43	37.39	8.8	62.19	19.63	8.8	46.07	12.97		
4 24.54	42.94	9.6	37.38	29.61	9.7	48.71	37.61	9.7	62.44	19.73	9.8	46.28	12.92		
4 24.40	43.18	10.6	37.47	29.89	10.7	48.97	37.81	10.7	62.67	19.82	10.8	46.47	12.87		
4 24.28	43.41	11.6	37.57	30.14	11.7	49.23	38.00	11.7	62.90	19.88	11.8	46.65	12.81		
4 24.17	43.64	12.6	37.68	30.38	12.7	49.50	38.16	12.7	63.12	19.93	12.8	46.82	12.73		
4 24.08	43.90	13.6	37.81	30.63	13.7	49.80	38.32	13.7	63.36	19.98	13.8	47.00	12.64		
4 23.99	44.18	14.6	37.94	30.89	14.7	50.13	38.50	14.7	63.63	20.01	14.8	47.20	12.53		
4 23.88	44.47	15.6	38.08	31.17	15.7	50.48	38.69	15.7	63.91	20.05	15.8	47.42	12.42		
4 23.75	44.78	16.6	38.22	31.48	16.7	50.84	38.91	16.7	64.20	20.12	16.8	47.65	12.33		
4 23.60	45.10	17.6	38.35	31.81	17.6	51.19	39.16	17.7	64.50	20.21	17.8	47.90	12.25		
4 23.43	45.40	18.6	38.48	32.16	18.6	51.53	39.42	18.7	64.80	20.33	18.8	48.14	12.20		
4 23.24	45.70	19.6	38.58	32.52	19.6	51.84	39.70	19.7	65.10	20.47	19.8	48.39	12.16		
4 23.05	45.97	20.6	38.67	32.88	20.6	52.13	39.99	20.7	65.38	20.62	20.8	48.64	12.15		
4 22.85	46.22	21.6	38.75	33.22	21.6	52.39	40.28	21.7	65.65	20.78	21.8	48.87	12.15		
4 22.66	46.45	22.6	38.81	33.57	22.6	52.64	40.57	22.7	65.90	20.94	22.8	49.10	12.16		
4 22.48	46.67	23.6	38.87	33.90	23.6	52.87	40.84	23.7	66.15	21.10	23.8	49.32	12.18		
4 22.30	46.88	24.6	38.91	34.22	24.6	53.10	41.11	24.7	66.37	21.26	24.8	49.54	12.20		
4 22.12	47.08	25.6	38.97	34.52	25.6	53.31	41.37	25.7	66.59	21.41	25.8	49.74	12.21		
4 21.96	47.28	26.6	39.02	34.81	26.6	53.52	41.61	26.7	66.82	21.55	26.8	49.94	12.22		
4 21.81	47.48	27.6	39.09	35.11	27.6	53.75	41.85	27.7	67.05	21.68	27.8	50.15	12.22		
4 21.65	47.70	28.6	39.15	35.41	28.6	53.99	42.10	28.7	67.29	21.81	28.8	50.35	12.21		
4 21.48	47.94	29.6	39.23	35.72	29.6	54.24	42.35	29.7	67.54	21.95	29.8	50.57	12.20		
4 21.31	48.18	30.6	39.32	36.06	30.6	54.51	42.61	30.7	67.80	22.10	30.8	50.80	12.19		
4 21.11	48.43	31.5	39.39	36.40	31.6	54.77	42.91	31.7	68.07	22.27	31.8	51.05	12.20		
11.94	-11.90	11.09	-11.04	18.46	-18.43	12.26	-12.22	9.79	-9.74						
42 <sup>m</sup>	9 <sup>s</sup> .88	5 <sup>h</sup> 46 <sup>m</sup>	38 <sup>s</sup> .12	7 <sup>h</sup> 17 <sup>m</sup>	0 <sup>s</sup> .79	9 <sup>h</sup> 9 <sup>m</sup>	14 <sup>s</sup> .21	10 <sup>h</sup> 59 <sup>m</sup>	56 <sup>s</sup> .00						
11'	57''.70	-84° 49'	49''.43	-86° 53'	53''.55	-85° 19'	28''.08	-84° 8'	11''.87						



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

4 Octantis (G.). Mag. 5.6			81 Mensæ (G.). Mag. 6.2			7 Octantis (G.). Mag. 6.4			5 Octantis. Mag. 5.4			7 Octant Mag. 6.	
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.
	h m	° '		h m	° '		h m	° '		h m	° '		h m
Dec.	1 42	85 11	Dec.	5 46	84 49	Dec.	7 16	86 53	Dec.	9 9	85 19	Dec.	10 59
	s	"		s	"		s	"		s	"		s
0.4	21.31	48.18	0.6	39.32	36.06	0.6	54.51	42.61	0.7	7.80	22.10	0.8	50.80
1.4	21.11	48.43	1.5	39.39	36.40	1.6	54.77	42.91	1.7	8.07	22.27	1.8	51.05
2.4	20.90	48.68	2.5	39.44	36.79	2.6	55.03	43.23	2.7	8.35	22.47	2.8	51.30
3.4	20.66	48.90	3.5	39.48	37.18	3.6	55.26	43.58	3.7	8.62	22.70	3.8	51.56
4.4	20.41	49.11	4.5	39.50	37.58	4.6	55.46	43.94	4.7	8.87	22.95	4.8	51.81
5.4	20.15	49.29	5.5	39.49	37.96	5.6	55.62	44.30	5.7	9.10	23.21	5.8	52.06
6.4	19.89	49.44	6.5	39.47	38.33	6.6	55.75	44.66	6.7	9.31	23.48	6.8	52.29
7.4	19.65	49.57	7.5	39.44	38.68	7.6	55.85	44.99	7.7	9.51	23.74	7.7	52.50
8.4	19.43	49.68	8.5	39.42	38.99	8.6	55.95	45.30	8.7	9.69	23.99	8.7	52.70
9.4	19.22	49.79	9.5	39.40	39.29	9.6	56.06	45.59	9.7	9.86	24.22	9.7	52.89
10.4	19.02	49.92	10.5	39.39	39.59	10.6	56.18	45.87	10.7	10.04	24.43	10.7	53.09
11.3	18.83	50.08	11.5	39.39	39.89	11.6	56.32	46.16	11.7	10.24	24.64	11.7	53.29
12.3	18.63	50.24	12.5	39.41	40.21	12.6	56.49	46.45	12.7	10.45	24.84	12.7	53.50
13.3	18.41	50.41	13.5	39.42	40.56	13.6	56.67	46.75	13.7	10.68	25.06	13.7	53.73
14.3	18.17	50.59	14.5	39.43	40.92	14.6	56.84	47.09	14.7	10.92	25.30	14.7	53.98
15.3	17.92	50.76	15.5	39.44	41.31	15.6	57.01	47.45	15.7	11.16	25.56	15.7	54.22
16.3	17.66	50.93	16.5	39.42	41.70	16.6	57.16	47.82	16.6	11.39	25.85	16.7	54.47
17.3	17.38	51.07	17.5	39.38	42.09	17.6	57.28	48.20	17.6	11.61	26.16	17.7	54.72
18.3	17.10	51.19	18.5	39.33	42.47	18.6	57.37	48.59	18.6	11.81	26.47	18.7	54.95
19.3	16.83	51.29	19.5	39.28	42.84	19.6	57.44	48.97	19.6	11.99	26.79	19.7	55.18
20.3	16.55	51.37	20.5	39.21	43.20	20.6	57.49	49.34	20.6	12.15	27.10	20.7	55.40
21.3	16.28	51.44	21.5	39.13	43.54	21.6	57.52	49.69	21.6	12.31	27.40	21.7	55.60
22.3	16.03	51.50	22.5	39.05	43.86	22.6	57.55	50.03	22.6	12.46	27.70	22.7	55.79
23.3	15.79	51.55	23.5	38.98	44.17	23.6	57.56	50.36	23.6	12.60	27.99	23.7	55.97
24.3	15.56	51.61	24.5	38.91	44.47	24.5	57.58	50.68	24.6	12.73	28.27	24.7	56.16
25.3	15.33	51.68	25.5	38.84	44.78	25.5	57.63	50.99	25.6	12.88	28.54	25.7	56.34
26.3	15.10	51.75	26.5	38.79	45.10	26.5	57.67	51.31	26.6	13.04	28.81	26.7	56.54
27.3	14.86	51.83	27.5	38.74	45.42	27.5	57.73	51.64	27.6	13.21	29.09	27.7	56.74
28.3	14.61	51.93	28.5	38.68	45.76	28.5	57.80	52.00	28.6	13.38	29.39	28.7	56.95
29.3	14.34	52.02	29.5	38.62	46.13	29.5	57.86	52.37	29.6	13.56	29.71	29.7	57.18
30.3	14.05	52.10	30.5	38.54	46.51	30.5	57.90	52.76	30.6	13.74	30.06	30.7	57.41
31.3	13.75	52.16	31.5	38.44	46.89	31.5	57.91	53.17	31.6	13.89	30.42	31.7	57.64
11.94 -11.90			11.09 -11.05			18.47 -18.44			12.27 -12.23			9.79	
1 <sup>h</sup> 42 <sup>m</sup> 9 <sup>s</sup> .88			5 <sup>h</sup> 46 <sup>m</sup> 38 <sup>s</sup> .12			7 <sup>h</sup> 17 <sup>m</sup> 0 <sup>s</sup> .79			9 <sup>h</sup> 9 <sup>m</sup> 14 <sup>s</sup> .21			10 <sup>h</sup> 59 <sup>m</sup>	
-85° 11' 57".70			-84° 49' 49".43			-86° 53' 53".55			-85° 19' 28".08			-84° 8'	

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

ε Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Jan.	12 45	-84 39	Jan.	14 13	-83 16	Jan.	18 4	-87 39	Jan.	19 23	-89 13	Jan.	22 15	-86 24
	s	"		s	"		s	"		s	"		s	"
0.8	50.65	27.92	0.8	2.81	36.16	0.9	34.16	56.88	1.0	22.88	52.84	1.1	40.53	19.84
1.8	50.90	28.06	1.8	3.01	36.16	1.9	34.45	56.59	2.0	23.18	52.51	2.1	40.35	19.56
2.7	51.13	28.18	2.8	3.21	36.17	2.9	34.73	56.31	3.0	23.49	52.18	3.1	40.17	19.30
3.7	51.36	28.30	3.8	3.40	36.17	3.9	34.98	56.04	4.0	23.74	51.87	4.1	39.99	19.05
4.7	51.59	28.40	4.8	3.59	36.16	4.9	35.22	55.76	5.0	23.91	51.56	5.1	39.80	18.81
5.7	51.82	28.49	5.8	3.78	36.14	5.9	35.44	55.47	6.0	24.04	51.25	6.1	39.59	18.58
6.7	52.06	28.57	6.8	3.98	36.10	6.9	35.65	55.17	7.0	24.11	50.90	7.1	39.36	18.33
7.7	52.32	28.65	7.8	4.19	36.05	7.9	35.88	54.84	8.0	24.17	50.55	8.1	39.12	18.06
8.7	52.60	28.75	8.8	4.41	36.01	8.9	36.15	54.49	9.0	24.32	50.16	9.1	38.88	17.76
9.7	52.89	28.87	9.8	4.65	35.99	9.9	36.46	54.13	10.0	24.59	49.76	10.1	38.64	17.44
10.7	53.18	29.01	10.8	4.90	35.98	10.9	36.80	53.78	11.0	24.97	49.35	11.1	38.41	17.10
11.7	53.46	29.18	11.8	5.15	36.00	11.9	37.20	53.44	11.9	25.51	48.95	12.1	38.21	16.74
12.7	53.73	29.38	12.8	5.40	36.06	12.9	37.63	53.12	12.9	26.18	48.56	13.1	38.05	16.37
13.7	53.99	29.60	13.8	5.63	36.14	13.9	38.07	52.83	13.9	26.94	48.21	14.1	37.92	16.02
14.7	54.22	29.81	14.8	5.85	36.23	14.9	38.50	52.57	14.9	27.69	47.89	15.1	37.81	15.68
15.7	54.45	30.02	15.8	6.06	36.32	15.9	38.91	52.33	15.9	28.42	47.56	16.1	37.70	15.36
16.7	54.66	30.21	16.8	6.26	36.39	16.9	39.28	52.09	16.9	29.08	47.27	17.1	37.59	15.06
17.7	54.88	30.39	17.8	6.45	36.46	17.9	39.64	51.85	17.9	29.64	46.96	18.1	37.47	14.78
18.7	55.09	30.55	18.8	6.64	36.50	18.9	39.97	51.59	18.9	30.15	46.64	19.1	37.33	14.49
19.7	55.32	30.71	19.8	6.85	36.54	19.9	40.31	51.32	19.9	30.61	46.32	20.1	37.17	14.19
20.7	55.56	30.87	20.8	7.06	36.57	20.9	40.65	51.04	20.9	31.09	45.98	21.1	37.00	13.88
21.7	55.82	31.04	21.8	7.28	36.61	21.9	41.02	50.74	21.9	31.60	45.63	22.1	36.83	13.55
22.7	56.08	31.22	22.8	7.51	36.65	22.9	41.41	50.43	22.9	32.19	45.26	23.1	36.66	13.20
23.7	56.34	31.42	23.8	7.74	36.71	23.9	41.84	50.13	23.9	32.87	44.88	24.1	36.51	12.84
24.7	56.59	31.64	24.8	7.98	36.79	24.9	42.29	49.83	24.9	33.64	44.50	25.1	36.37	12.46
25.7	56.85	31.88	25.7	8.22	36.89	25.9	42.78	49.54	25.9	34.54	44.13	26.1	36.25	12.08
26.7	57.09	32.14	26.7	8.45	37.02	26.9	43.29	49.28	26.9	35.53	43.76	27.1	36.15	11.68
27.7	57.33	32.41	27.7	8.68	37.15	27.9	43.81	49.03	27.9	36.58	43.43	28.1	36.08	11.30
28.7	57.55	32.69	28.7	8.91	37.31	28.9	44.34	48.81	28.9	37.69	43.10	29.1	36.03	10.92
29.7	57.75	32.97	29.7	9.11	37.47	29.9	44.86	48.60	29.9	38.80	42.81	30.1	35.99	10.56
30.7	57.94	33.24	30.7	9.31	37.64	30.9	45.35	48.41	30.9	39.86	42.51	31.1	35.96	10.22
31.7	58.13	33.50	31.7	9.50	37.79	31.9	45.82	48.22	31.9	40.87	42.24	32.1	35.92	9.88
0.74	-10.69		8.54	-8.48		24.54	-24.52		74.40	-74.39		15.95	-15.91	
45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> 5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	43 <sup>s</sup> .98	
39'	43''.10		-83° 16'	47''.50		-87° 39'	52''.55		-89° 13'	43''.28		-86° 24'	3''.31	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ι Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Oct Mag.	
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Rig Ascen sion
	h m	° '		h m	° '		h m	° '		h m	° '		h
Feb.	12 45	-84 39	Feb.	14 13	-83 16	Feb.	18 4	-87 39	Feb.	19 23	-89 13	Feb.	22 1
	s	"		s	"		s	"		s	"		s
0.7	58.13	33.50	0.7	9.50	37.79	0.9	45.82	48.22	0.9	40.87	42.24	1.1	35.6
1.7	58.32	33.74	1.7	9.69	37.93	1.9	46.28	48.02	1.9	41.81	41.96	2.1	35.8
2.7	58.51	33.98	2.7	9.88	38.05	2.9	46.72	47.80	2.9	42.69	41.68	3.1	35.8
3.7	58.71	34.21	3.7	10.09	38.17	3.9	47.17	47.57	3.9	43.53	41.36	4.1	35.7
4.7	58.93	34.44	4.7	10.30	38.28	4.9	47.64	47.32	4.9	44.40	41.02	5.1	35.6
5.7	59.17	34.68	5.7	10.53	38.40	5.9	48.13	47.05	5.9	45.35	40.67	6.1	35.5
6.7	59.40	34.95	6.7	10.76	38.54	6.9	48.67	46.79	6.9	46.45	40.29	7.0	35.4
7.7	59.64	35.25	7.7	11.00	38.70	7.9	49.26	46.54	7.9	47.68	39.94	8.0	35.3
8.6	59.87	35.58	8.7	11.24	38.89	8.9	49.87	46.31	8.9	49.04	39.59	9.0	35.3
9.6	60.08	35.93	9.7	11.47	39.11	9.9	50.51	46.11	9.9	50.49	39.28	10.0	35.3
10.6	60.27	36.28	10.7	11.68	39.34	10.9	51.13	45.94	10.9	51.97	38.98	11.0	35.3
11.6	60.43	36.63	11.7	11.87	39.58	11.9	51.74	45.79	11.9	53.43	38.72	12.0	35.4
12.6	60.59	36.96	12.7	12.06	39.82	12.9	52.32	45.65	12.9	54.82	38.46	13.0	35.4
13.6	60.75	37.27	13.7	12.23	40.04	13.9	52.87	45.52	13.9	56.13	38.24	14.0	35.5
14.6	60.90	37.56	14.7	12.40	40.24	14.9	53.39	45.37	14.9	57.36	37.99	15.0	35.5
15.6	61.06	37.85	15.7	12.58	40.43	15.9	53.91	45.22	15.9	58.55	37.74	16.0	35.5
16.6	61.23	38.12	16.7	12.77	40.62	16.8	54.42	45.05	16.9	59.69	37.46	17.0	35.5
17.6	61.41	38.40	17.7	12.97	40.79	17.8	54.95	44.86	17.9	60.86	37.17	18.0	35.4
18.6	61.59	38.70	18.7	13.17	40.97	18.8	55.49	44.66	18.9	62.08	36.87	19.0	35.4
19.6	61.79	39.01	19.7	13.37	41.17	19.8	56.08	44.46	19.9	63.37	36.57	20.0	35.4
20.6	61.98	39.34	20.7	13.58	41.38	20.8	56.68	44.27	20.9	64.74	36.26	21.0	35.4
21.6	62.16	39.68	21.7	13.79	41.61	21.8	57.31	44.09	21.9	66.22	35.96	22.0	35.4
22.6	62.34	40.04	22.7	14.00	41.86	22.8	57.96	43.93	22.9	67.80	35.67	23.0	35.4
23.6	62.50	40.41	23.7	14.21	42.13	23.8	58.64	43.79	23.9	69.45	35.41	24.0	35.4
24.6	62.65	40.79	24.7	14.40	42.41	24.8	59.31	43.67	24.9	71.14	35.16	24.9	35.4
25.6	62.78	41.17	25.7	14.57	42.70	25.8	59.97	43.57	25.9	72.85	34.93	25.9	35.4
26.6	62.89	41.55	26.7	14.74	42.99	26.8	60.61	43.49	26.9	74.55	34.73	26.9	35.4
27.6	63.01	41.91	27.7	14.90	43.28	27.8	61.23	43.42	27.9	76.16	34.53	27.9	36.0
28.6	63.12	42.25	28.7	15.05	43.55	28.8	61.82	43.35	28.9	77.69	34.33	28.9	36.0
29.6	63.23	42.59	29.7	15.21	43.80	29.8	62.40	43.27	29.9	79.16	34.14	29.9	36.0
30.6	63.35	42.91	30.6	15.38	44.04	30.8	62.96	43.17	30.9	80.57	33.92	30.9	36.0
31.6	63.49	43.22	31.6	15.54	44.27	31.8	63.53	43.04	31.9	81.96	33.70	31.9	36.0
10.74	-10.70		8.54	-8.48		24.52	-24.50		74.14	-74.13		15.93	
12 <sup>h</sup> 45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> 5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	
-84° 39'	43'' .10		-83° 16'	47'' .50		-87° 39'	52'' .55		-89° 13'	43'' .28		-86° 24'	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ζ Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
Apr.	h m	° '	Apr.	h m	° '	Apr.	h m	° '	Apr.	h m	° '	Apr.	h m	° '
	12 46	84 39		14 13	83 16		18 5	87 39		19 25	89 13		22 15	86 13
	s	"		s	"		s	"		s	"		s	"
0.5	5.69	53.86	0.6	19.46	53.10	0.7	21.66	42.21	0.8	11.70	29.15	0.9	41.16	48.01
1.5	5.75	54.22	1.6	19.58	53.41	1.7	22.29	42.20	1.8	13.46	29.01	1.9	41.35	47.66
2.5	5.81	54.61	2.6	19.70	53.74	2.7	22.95	42.19	2.8	15.33	28.87	2.9	41.55	47.29
3.5	5.86	55.02	3.6	19.83	54.09	3.7	23.65	42.20	3.8	17.32	28.75	3.9	41.78	46.92
4.5	5.90	55.44	4.6	19.96	54.47	4.7	24.37	42.23	4.8	19.41	28.63	4.9	42.03	46.55
5.5	5.92	55.88	5.6	20.07	54.86	5.7	25.10	42.29	5.8	21.55	28.54	5.9	42.31	46.19
6.5	5.92	56.31	6.6	20.16	55.26	6.7	25.80	42.38	6.8	23.68	28.49	6.9	42.62	45.86
7.5	5.91	56.73	7.6	20.24	55.66	7.7	26.46	42.50	7.8	25.75	28.45	7.9	42.94	45.50
8.5	5.88	57.12	8.5	20.30	56.05	8.7	27.10	42.62	8.8	27.72	28.43	8.9	43.25	45.14
9.5	5.84	57.50	9.5	20.36	56.42	9.7	27.69	42.74	9.8	29.60	28.42	9.9	43.54	44.80
10.5	5.81	57.85	10.5	20.41	56.76	10.7	28.26	42.85	10.8	31.38	28.41	10.9	43.82	44.47
11.5	5.78	58.19	11.5	20.47	57.09	11.7	28.80	42.95	11.8	33.07	28.39	11.9	44.08	44.14
12.5	5.77	58.53	12.5	20.53	57.41	12.7	29.35	43.03	12.8	34.75	28.35	12.9	44.33	43.81
13.5	5.77	58.87	13.5	20.60	57.72	13.7	29.91	43.09	13.8	36.43	28.31	13.9	44.57	43.48
14.5	5.78	59.21	14.5	20.68	58.04	14.7	30.48	43.16	14.7	38.17	28.25	14.9	44.80	43.15
15.5	5.79	59.56	15.5	20.77	58.37	15.7	31.08	43.23	15.7	39.96	28.18	15.9	45.05	42.82
16.5	5.79	59.93	16.5	20.86	58.71	16.7	31.69	43.30	16.7	41.81	28.12	16.9	45.31	42.49
17.5	5.79	60.31	17.5	20.94	59.07	17.7	32.32	43.38	17.7	43.73	28.07	17.9	45.59	42.16
18.5	5.77	60.70	18.5	21.02	59.44	18.7	32.97	43.48	18.7	45.73	28.03	18.9	45.89	41.83
19.5	5.75	61.10	19.5	21.08	59.82	19.7	33.61	43.61	19.7	47.76	28.02	19.9	46.21	41.50
20.5	5.70	61.50	20.5	21.14	60.21	20.7	34.24	43.76	20.7	49.80	28.03	20.9	46.54	41.17
21.5	5.64	61.90	21.5	21.18	60.61	21.7	34.86	43.92	21.7	51.83	28.07	21.8	46.89	40.84
22.4	5.57	62.28	22.5	21.21	61.00	22.7	35.46	44.10	22.7	53.80	28.11	22.8	47.24	40.51
23.4	5.49	62.65	23.5	21.24	61.38	23.7	36.02	44.28	23.7	55.68	28.17	23.8	47.58	40.18
24.4	5.41	62.99	24.5	21.25	61.74	24.7	36.55	44.46	24.7	57.48	28.23	24.8	47.92	40.85
25.4	5.34	63.31	25.5	21.27	62.09	25.7	37.06	44.63	25.7	59.18	28.29	25.8	48.24	40.52
26.4	5.27	63.62	26.5	21.30	62.41	26.7	37.56	44.77	26.7	60.83	28.32	26.8	48.53	40.19
27.4	5.22	63.93	27.5	21.33	62.72	27.7	38.06	44.90	27.7	62.46	28.33	27.8	48.80	40.86
28.4	5.19	64.26	28.5	21.37	63.04	28.7	38.59	45.02	28.7	64.14	28.33	28.8	49.07	40.53
29.4	5.16	64.60	29.5	21.43	63.38	29.7	39.15	45.13	29.7	65.91	28.31	29.8	49.36	40.20
30.4	5.12	64.95	30.5	21.48	63.73	30.6	39.74	45.25	30.7	67.77	28.31	30.8	49.66	40.87
31.4	5.08	65.33	31.5	21.53	64.10	31.6	40.35	45.39	31.7	69.74	28.32	31.8	49.99	40.54
10.76	-10.71		8.55	-8.49		24.51	-24.49		73.88	-73.88		15.91	-15.87	
12 <sup>h</sup> 45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> 5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	43 <sup>s</sup> .98	
-84° 39'	43'' .10		-83° 16'	47'' .50		-87° 39'	52'' .55		-89° 13'	43'' .28		-86° 24'	3'' .31	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ζ Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
m	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
1	12 46	-84 40	May	14 13	-83 17	May	18 5	-87 39	May	19 26	-89 13	May	22 15	-86 23
	s	"		s	"		s	"		s	"		s	"
4	5.12	4.95	0.5	21.48	3.73	0.6	39.74	45.25	0.7	7.77	28.31	0.8	49.66	39.64
4	5.08	5.33	1.5	21.53	4.10	1.6	40.35	45.39	1.7	9.74	28.32	1.8	49.99	39.38
4	5.02	5.72	2.5	21.57	4.49	2.6	40.97	45.55	2.7	11.77	28.35	2.8	50.34	39.12
4	4.94	6.11	3.5	21.59	4.89	3.6	41.58	45.74	3.7	13.81	28.41	3.8	50.72	38.88
4	4.84	6.48	4.5	21.60	5.30	4.6	42.16	45.97	4.7	15.83	28.51	4.8	51.12	38.68
4	4.72	6.84	5.5	21.59	5.70	5.6	42.70	46.21	5.7	17.74	28.62	5.8	51.52	38.51
4	4.60	7.17	6.5	21.58	6.07	6.6	43.19	46.45	6.7	19.52	28.74	6.8	51.90	38.35
4	4.48	7.47	7.5	21.56	6.42	7.6	43.64	46.68	7.7	21.18	28.87	7.8	52.25	38.21
4	4.37	7.75	8.5	21.53	6.75	8.6	44.07	46.90	8.7	22.74	28.99	8.8	52.59	38.07
4	4.26	8.03	9.5	21.51	7.05	9.6	44.49	47.09	9.7	24.25	29.08	9.8	52.91	37.94
4	4.17	8.30	10.5	21.51	7.34	10.6	44.91	47.27	10.7	25.75	29.17	10.8	53.22	37.79
4	4.07	8.57	11.5	21.51	7.64	11.6	45.35	47.45	11.7	27.26	29.24	11.8	53.52	37.64
4	3.99	8.86	12.5	21.51	7.94	12.6	45.80	47.62	12.7	28.82	29.31	12.8	53.83	37.47
4	3.91	9.15	13.5	21.52	8.26	13.6	46.27	47.78	13.7	30.45	29.37	13.8	54.14	37.29
4	3.82	9.46	14.4	21.53	8.59	14.6	46.75	47.96	14.7	32.13	29.45	14.8	54.47	37.11
4	3.73	9.77	15.4	21.53	8.93	15.6	47.25	48.17	15.7	33.87	29.54	15.8	54.83	36.94
4	3.62	10.10	16.4	21.52	9.28	16.6	47.75	48.39	16.7	35.64	29.65	16.8	55.20	36.77
4	3.50	10.42	17.4	21.50	9.64	17.6	48.24	48.63	17.7	37.42	29.78	17.8	55.58	36.62
4	3.36	10.73	18.4	21.48	10.01	18.6	48.72	48.89	18.7	39.20	29.93	18.8	55.98	36.49
4	3.22	11.04	19.4	21.44	10.37	19.6	49.17	49.16	19.7	40.92	30.09	19.8	56.39	36.37
4	3.06	11.32	20.4	21.38	10.72	20.6	49.58	49.45	20.7	42.56	30.27	20.8	56.79	36.28
4	2.90	11.58	21.4	21.33	11.05	21.6	49.96	49.73	21.6	44.09	30.46	21.8	57.18	36.21
4	2.74	11.83	22.4	21.27	11.36	22.6	50.32	50.00	22.6	45.52	30.65	22.8	57.54	36.14
4	2.59	12.06	23.4	21.21	11.65	23.6	50.65	50.25	23.6	46.87	30.81	23.8	57.89	36.08
4	2.45	12.28	24.4	21.16	11.93	24.6	50.97	50.48	24.6	48.19	30.97	24.8	58.21	36.01
4	2.33	12.51	25.4	21.13	12.20	25.6	51.31	50.69	25.6	49.51	31.09	25.8	58.52	35.92
4	2.22	12.75	26.4	21.10	12.48	26.6	51.68	50.89	26.6	50.91	31.21	26.8	58.83	35.80
4	2.11	13.00	27.4	21.08	12.77	27.6	52.08	51.10	27.6	52.38	31.32	27.7	59.16	35.68
4	2.00	13.27	28.4	21.06	13.08	28.6	52.50	51.32	28.6	53.95	31.45	28.7	59.51	35.55
3	1.87	13.55	29.4	21.04	13.41	29.6	52.94	51.57	29.6	55.60	31.59	29.7	59.89	35.43
3	1.73	13.84	30.4	20.99	13.76	30.6	53.38	51.84	30.6	57.28	31.76	30.7	60.29	35.32
3	1.56	14.13	31.4	20.93	14.11	31.6	53.79	52.14	31.6	58.94	31.96	31.7	60.71	35.24
1.76	-10.72		8.55	-8.49		24.53	-24.51		73.92	-73.91		15.90	-15.87	
45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> 5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	43 <sup>s</sup> .98	
39'	43''.10		-83° 16'	47''.50		-87° 39'	52''.55		-89° 13'	43''.28		-86° 24'	3''.31	

[Eph 15]

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ε Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
June	12 45	84 40	June	14 13	83 17	June	18 5	87 39	June	19 26	89 13	June	22 16	86 13
	s	"		s	"		s	"		s	"		s	"
0.3	61.56	14.13	0.4	20.93	14.11	0.6	53.79	52.14	0.6	58.94	31.96	0.7	0.71	35.24
1.3	61.37	14.40	1.4	20.86	14.45	1.6	54.16	52.46	1.6	60.50	32.18	1.7	1.13	35.19
2.3	61.17	14.63	2.4	20.77	14.77	2.6	54.47	52.78	2.6	61.92	32.43	2.7	1.53	35.17
3.3	60.98	14.84	3.4	20.67	15.07	3.6	54.75	53.09	3.6	63.22	32.66	3.7	1.92	35.17
4.3	60.80	15.03	4.4	20.58	15.34	4.6	55.00	53.39	4.6	64.42	32.90	4.7	2.28	35.18
5.3	60.62	15.19	5.4	20.49	15.58	5.6	55.23	53.67	5.6	65.52	33.11	5.7	2.62	35.19
6.3	60.45	15.35	6.4	20.40	15.82	6.5	55.44	53.93	6.6	66.57	33.33	6.7	2.94	35.19
7.3	60.29	15.52	7.4	20.32	16.05	7.5	55.67	54.18	7.6	67.62	33.51	7.7	3.25	35.20
8.3	60.15	15.68	8.4	20.25	16.28	8.5	55.91	54.42	8.6	68.70	33.69	8.7	3.57	35.21
9.3	60.01	15.85	9.4	20.19	16.52	9.5	56.17	54.66	9.6	69.83	33.88	9.7	3.89	35.22
10.3	59.86	16.03	10.4	20.13	16.76	10.5	56.44	54.90	10.6	71.00	34.06	10.7	4.22	35.23
11.3	59.71	16.23	11.4	20.06	17.02	11.5	56.72	55.16	11.6	72.23	34.25	11.7	4.57	35.24
12.3	59.54	16.43	12.4	19.99	17.29	12.5	57.00	55.45	12.6	73.51	34.46	12.7	4.93	35.25
13.3	59.36	16.63	13.4	19.90	17.57	13.5	57.27	55.75	13.6	74.79	34.69	13.7	5.30	35.26
14.3	59.17	16.82	14.4	19.80	17.85	14.5	57.54	56.06	14.6	76.07	34.93	14.7	5.69	35.27
15.3	58.97	17.01	15.4	19.70	18.13	15.5	57.78	56.39	15.6	77.29	35.20	15.7	6.08	35.28
16.3	58.75	17.17	16.4	19.58	18.40	16.5	57.98	56.72	16.6	78.43	35.48	16.7	6.48	35.29
17.3	58.53	17.32	17.4	19.46	18.65	17.5	58.15	57.06	17.6	79.46	35.76	17.7	6.86	35.30
18.3	58.31	17.44	18.4	19.33	18.88	18.5	58.28	57.39	18.6	80.38	36.05	18.7	7.22	35.31
19.3	58.10	17.54	19.4	19.20	19.09	19.5	58.38	57.70	19.6	81.18	36.33	19.7	7.55	35.32
20.3	57.91	17.63	20.3	19.08	19.27	20.5	58.47	57.98	20.6	81.93	36.58	20.7	7.86	35.33
21.3	57.73	17.72	21.3	18.97	19.44	21.5	58.57	58.25	21.6	82.67	36.81	21.7	8.15	35.34
22.3	57.57	17.82	22.3	18.88	19.61	22.5	58.69	58.50	22.6	83.44	37.02	22.7	8.43	35.35
23.3	57.41	17.92	23.3	18.79	19.79	23.5	58.84	58.75	23.6	84.28	37.22	23.7	8.72	35.36
24.3	57.25	18.05	24.3	18.71	20.00	24.5	59.02	59.00	24.6	85.23	37.43	24.7	9.03	35.37
25.3	57.08	18.19	25.3	18.61	20.22	25.5	59.22	59.28	25.6	86.26	37.65	25.7	9.36	35.38
26.3	56.90	18.34	26.3	18.51	20.44	26.5	59.41	59.58	26.6	87.34	37.91	26.7	9.72	35.39
27.3	56.69	18.49	27.3	18.40	20.71	27.5	59.59	59.91	27.5	88.41	38.18	27.7	10.10	35.40
28.3	56.47	18.63	28.3	18.27	20.95	28.5	59.74	60.26	28.5	89.38	38.48	28.7	10.48	35.41
29.3	56.23	18.74	29.3	18.13	21.17	29.5	59.84	60.61	29.5	90.22	38.79	29.7	10.85	35.42
30.3	56.00	18.82	30.3	17.98	21.37	30.5	59.89	60.96	30.5	90.94	39.11	30.7	11.21	35.43
31.3	55.77	18.87	31.3	17.82	21.54	31.5	59.90	61.30	31.5	91.52	39.43	31.7	11.53	35.44
10.77	-10.72		8.56	-8.50		24.55	-24.53		74.07	-74.06		15.90	-15.86	
12 <sup>h</sup> 45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> 5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	43 <sup>s</sup> .98	
-84° 39'	43''.10		-83° 16'	47''.50		-87° 39'	52''.55		-89° 13'	43''.28		-86° 24'	3''.31	



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ζ Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.	Mean Solar Date.	Right Ascension.	Declination South.
h m	° '		h m	° '		h m	° '		h m	° '		h m	° '	
July 12 45	84 40		July 14 13	83 17		July 18 5	87 40		July 19 27	89 13		July 22 16	86 23	
s	"		s	"		s	"		s	"		s	"	
3 56.00	18.82	0.3	17.98	21.37	0.5	59.89	0.96	0.5	30.94	39.11	0.7	11.21	36.03	
3 55.77	18.87	1.3	17.82	21.54	1.5	59.90	1.30	1.5	31.52	39.43	1.7	11.53	36.18	
3 55.55	18.90	2.3	17.67	21.68	2.5	59.88	1.61	2.5	32.00	39.75	2.7	11.83	36.33	
3 55.35	18.92	3.3	17.53	21.81	3.5	59.86	1.90	3.5	32.43	40.02	3.6	12.11	36.48	
2 55.15	18.94	4.3	17.40	21.92	4.5	59.83	2.17	4.5	32.81	40.30	4.6	12.37	36.62	
2 54.97	18.95	5.3	17.28	22.03	5.5	59.81	2.43	5.5	33.22	40.54	5.6	12.62	36.75	
2 54.80	18.97	6.3	17.16	22.14	6.5	59.81	2.69	6.5	33.65	40.79	6.6	12.88	36.86	
2 54.62	19.01	7.3	17.04	22.27	7.5	59.82	2.95	7.5	34.14	41.04	7.6	13.14	36.97	
2 54.43	19.05	8.3	16.92	22.40	8.5	59.84	3.22	8.5	34.66	41.29	8.6	13.42	37.08	
2 54.24	19.10	9.3	16.79	22.54	9.5	59.88	3.51	9.5	35.22	41.56	9.6	13.71	37.20	
2 54.04	19.15	10.3	16.65	22.70	10.5	59.90	3.81	10.5	35.81	41.84	10.6	14.02	37.32	
2 53.82	19.20	11.3	16.51	22.85	11.5	59.91	4.12	11.5	36.38	42.14	11.6	14.33	37.46	
2 53.60	19.24	12.3	16.36	23.01	12.4	59.91	4.45	12.5	36.93	42.45	12.6	14.65	37.62	
2 53.38	19.26	13.3	16.20	23.15	13.4	59.88	4.79	13.5	37.39	42.78	13.6	14.96	37.79	
2 53.14	19.26	14.3	16.03	23.28	14.4	59.80	5.12	14.5	37.74	43.12	14.6	15.27	37.99	
2 52.89	19.24	15.3	15.86	23.38	15.4	59.69	5.45	15.5	37.98	43.45	15.6	15.55	38.20	
2 52.66	19.20	16.3	15.68	23.46	16.4	59.55	5.76	16.5	38.10	43.78	16.6	15.81	38.43	
2 52.45	19.14	17.3	15.52	23.52	17.4	59.39	6.05	17.5	38.13	44.08	17.6	16.05	38.65	
2 52.26	19.07	18.3	15.36	23.56	18.4	59.23	6.32	18.5	38.10	44.38	18.6	16.26	38.86	
2 52.08	19.00	19.3	15.22	23.59	19.4	59.08	6.57	19.5	38.09	44.64	19.6	16.45	39.05	
2 51.91	18.94	20.3	15.09	23.63	20.4	58.95	6.80	20.5	38.15	44.90	20.6	16.65	39.22	
2 51.74	18.91	21.3	14.96	23.68	21.4	58.86	7.03	21.5	38.29	45.14	21.6	16.86	39.37	
2 51.57	18.89	22.3	14.84	23.75	22.4	58.80	7.27	22.5	38.52	45.40	22.6	17.08	39.51	
2 51.40	18.89	23.3	14.71	23.85	23.4	58.74	7.54	23.5	38.82	45.66	23.6	17.33	39.67	
2 51.20	18.88	24.3	14.57	23.95	24.4	58.67	7.83	24.5	39.13	45.95	24.6	17.60	39.84	
2 50.98	18.86	25.3	14.41	24.05	25.4	58.58	8.14	25.5	39.39	46.28	25.6	17.88	40.04	
2 50.75	18.83	26.2	14.23	24.14	26.4	58.44	8.46	26.5	39.53	46.61	26.6	18.15	40.27	
2 50.52	18.76	27.2	14.06	24.20	27.4	58.26	8.78	27.5	39.54	46.96	27.6	18.40	40.52	
2 50.29	18.67	28.2	13.87	24.24	28.4	58.03	9.09	28.5	39.42	47.29	28.6	18.63	40.79	
2 50.07	18.56	29.2	13.69	24.24	29.4	57.77	9.38	29.5	39.16	47.62	29.6	18.83	41.06	
2 49.86	18.43	30.2	13.52	24.22	30.4	57.49	9.64	30.5	38.83	47.93	30.6	18.99	41.33	
2 49.67	18.29	31.2	13.35	24.19	31.4	57.21	9.88	31.5	38.43	48.22	31.6	19.14	41.59	
1.77	-10.72		8.56	-8.50		24.58	-24.56		74.29	-74.28		15.90	-15.87	
45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> 5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	43 <sup>s</sup> .98	
39'	43''.10		-83° 16'	47''.50		-87° 39'	52''.55		-89° 13'	43''.28		-86° 24'	3''.31	



APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

ζ Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
an lar te.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.	Mean Solar Date.	Right Ascen- sion.	Declina- tion South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
pt.	12 45	84 40	Sept.	14 13	83 17	Sept.	18 5	87 40	Sept.	19 26	89 13	Sept.	22 16	86 23
	s	"		s	"		s	"		s	"		s	"
-1	44.71	12.76	0.2	8.63	21.67	0.3	46.75	16.00	0.4	79.03	56.28	0.5	22.04	50.05
-1	44.62	12.53	1.1	8.51	21.51	1.3	46.36	16.11	1.4	78.07	56.46	1.5	22.03	50.32
-1	44.51	12.30	2.1	8.38	21.36	2.3	45.97	16.23	2.4	77.14	56.66	2.5	22.03	50.59
-1	44.39	12.08	3.1	8.25	21.22	3.3	45.57	16.35	3.4	76.24	56.86	3.5	22.04	50.87
-1	44.27	11.85	4.1	8.12	21.07	4.3	45.16	16.49	4.4	75.31	57.08	4.5	22.06	51.15
-1	44.14	11.62	5.1	7.98	20.92	5.3	44.74	16.64	5.4	74.34	57.31	5.5	22.07	51.45
-1	44.01	11.37	6.1	7.83	20.76	6.3	44.29	16.78	6.4	73.29	57.54	6.5	22.08	51.77
-1	43.88	11.11	7.1	7.68	20.59	7.3	43.81	16.92	7.4	72.18	57.77	7.5	22.08	52.09
-1	43.76	10.83	8.1	7.53	20.39	8.3	43.30	17.05	8.3	70.95	58.00	8.5	22.05	52.43
-1	43.65	10.53	9.1	7.39	20.17	9.3	42.77	17.16	9.3	69.61	58.22	9.5	21.99	52.77
-1	43.56	10.22	10.1	7.25	19.93	10.3	42.24	17.24	10.3	68.20	58.40	10.5	21.90	53.10
-1	43.48	9.90	11.1	7.13	19.68	11.3	41.71	17.29	11.3	66.76	58.57	11.5	21.80	53.40
-1	43.42	9.59	12.1	7.02	19.42	12.3	41.20	17.31	12.3	65.34	58.70	12.5	21.68	53.69
-1	43.38	9.30	13.1	6.93	19.18	13.3	40.72	17.32	13.3	63.99	58.80	13.5	21.55	53.95
-1	43.35	9.03	14.1	6.85	18.95	14.3	40.28	17.33	14.3	62.76	58.90	14.4	21.43	54.19
-0	43.31	8.77	15.1	6.77	18.73	15.3	39.87	17.35	15.3	61.61	59.03	15.4	21.33	54.43
-0	43.25	8.53	16.1	6.68	18.53	16.3	39.46	17.39	16.3	60.52	59.15	16.4	21.26	54.67
-0	43.19	8.29	17.1	6.58	18.35	17.3	39.06	17.45	17.3	59.46	59.29	17.4	21.21	54.92
-0	43.11	8.05	18.1	6.47	18.17	18.3	38.63	17.53	18.3	58.34	59.46	18.4	21.16	55.19
-0	43.03	7.78	19.1	6.35	17.97	19.3	38.16	17.62	19.3	57.12	59.64	19.4	21.09	55.49
-0	42.94	7.49	20.1	6.23	17.75	20.3	37.65	17.69	20.3	55.76	59.81	20.4	21.01	55.80
-0	42.86	7.17	21.1	6.10	17.51	21.3	37.10	17.74	21.3	54.30	59.98	21.4	20.90	56.12
-0	42.80	6.83	22.1	5.99	17.23	22.3	36.53	17.77	22.3	52.72	60.13	22.4	20.76	56.45
-0	42.75	6.49	23.1	5.89	16.94	23.2	35.97	17.77	23.3	51.11	60.25	23.4	20.59	56.76
-0	42.73	6.15	24.1	5.80	16.63	24.2	35.40	17.75	24.3	49.46	60.35	24.4	20.41	57.05
-0	42.72	5.82	25.1	5.73	16.33	25.2	34.86	17.70	25.3	47.83	60.42	25.4	20.21	57.32
-0	42.73	5.50	26.1	5.67	16.04	26.2	34.35	17.65	26.3	46.27	60.47	26.4	20.01	57.58
-0	42.74	5.18	27.1	5.61	15.75	27.2	33.86	17.59	27.3	44.77	60.53	27.4	19.81	57.81
-0	42.74	4.88	28.1	5.56	15.47	28.2	33.39	17.54	28.3	43.33	60.57	28.4	19.63	58.04
-0	42.75	4.60	29.1	5.51	15.21	29.2	32.93	17.49	29.3	41.95	60.62	29.4	19.46	58.27
-0	42.75	4.32	30.1	5.45	14.96	30.2	32.48	17.45	30.3	40.60	60.69	30.4	19.29	58.50
-0	42.74	4.05	31.1	5.38	14.71	31.2	32.03	17.43	31.3	39.26	60.76	31.4	19.14	58.74
0.76	-10.72		8.56	-8.50		24.61	-24.59		74.71	-74.70		15.92	-15.89	
h 45 <sup>m</sup>	55°.22		14 <sup>h</sup> 13 <sup>m</sup>	9°.28		18 <sup>h</sup> 5 <sup>m</sup>	0°.43		19 <sup>h</sup> 24 <sup>m</sup>	31°.66		22 <sup>h</sup> 15 <sup>m</sup>	43°.98	
° 39'	43''.10		-83° 16'	47''.50		-87° 39'	52''.55		-89° 13'	43''.28		-86° 24'	3''.31	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ι Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Oct.	12 45	84 39	Oct.	14 13	83 17	Oct.	18 5	87 40	Oct.	19 25	89 13	Oct.	22 16	86 13
	s	"		s	"		s	"		s	"		s	"
1.0	42.74	64.05	1.1	5.38	14.71	1.2	32.03	17.43	1.3	99.26	60.76	1.4	19.14	58.74
2.0	42.73	63.77	2.1	5.31	14.46	2.2	31.57	17.41	2.3	97.90	60.84	2.4	18.99	58.98
3.0	42.71	63.48	3.1	5.24	14.21	3.2	31.10	17.40	3.3	96.50	60.93	3.4	18.84	59.24
3.9	42.69	63.18	4.1	5.16	13.96	4.2	30.61	17.38	4.3	95.03	61.02	4.4	18.67	59.51
4.9	42.68	62.86	5.1	5.09	13.68	5.2	30.09	17.35	5.3	93.48	61.10	5.4	18.50	59.79
5.9	42.68	62.54	6.1	5.01	13.38	6.2	29.54	17.31	6.3	91.84	61.18	6.4	18.30	60.06
6.9	42.69	62.20	7.1	4.95	13.06	7.2	28.98	17.23	7.3	90.12	61.22	7.4	18.06	60.33
7.9	42.72	61.85	8.0	4.90	12.72	8.2	28.44	17.14	8.3	88.36	61.25	8.4	17.80	60.6
8.9	42.77	61.51	9.0	4.87	12.39	9.2	27.92	17.01	9.3	86.63	61.23	9.4	17.52	60.80
9.9	42.84	61.18	10.0	4.85	12.05	10.2	27.43	16.86	10.3	84.96	61.20	10.4	17.24	61.00
10.9	42.92	60.88	11.0	4.84	11.74	11.2	26.97	16.71	11.3	83.42	61.14	11.4	16.97	61.17
11.9	43.00	60.61	12.0	4.84	11.45	12.2	26.56	16.56	12.3	81.98	61.10	12.4	16.71	61.33
12.9	43.07	60.36	13.0	4.85	11.18	13.2	26.18	16.42	13.3	80.65	61.05	13.4	16.47	61.49
13.9	43.14	60.11	14.0	4.84	10.92	14.2	25.80	16.31	14.2	79.35	61.03	14.4	16.26	61.64
14.9	43.19	59.86	15.0	4.82	10.67	15.2	25.41	16.22	15.2	78.03	61.02	15.4	16.06	61.82
15.9	43.23	59.60	16.0	4.79	10.41	16.2	24.98	16.13	16.2	76.66	61.02	16.4	15.85	62.02
16.9	43.26	59.32	17.0	4.76	10.14	17.2	24.52	16.05	17.2	75.19	61.06	17.4	15.64	62.24
17.9	43.30	59.02	18.0	4.72	9.84	18.2	24.04	15.96	18.2	73.60	61.06	18.4	15.40	62.46
18.9	43.35	58.70	19.0	4.69	9.52	19.2	23.53	15.83	19.2	71.92	61.05	19.4	15.14	62.69
19.9	43.42	58.37	20.0	4.68	9.18	20.2	23.01	15.68	20.2	70.18	61.00	20.3	14.84	62.91
20.9	43.51	58.03	21.0	4.67	8.84	21.2	22.50	15.50	21.2	68.42	60.95	21.3	14.52	63.11
21.9	43.62	57.70	22.0	4.69	8.48	22.2	22.02	15.30	22.2	66.68	60.86	22.3	14.20	63.27
22.9	43.75	57.39	23.0	4.71	8.13	23.2	21.56	15.09	23.2	65.02	60.76	23.3	13.86	63.43
23.9	43.87	57.09	24.0	4.74	7.81	24.2	21.14	14.88	24.2	63.42	60.65	24.3	13.54	63.56
24.9	44.00	56.82	25.0	4.78	7.49	25.2	20.75	14.66	25.2	61.91	60.53	25.3	13.22	63.67
25.9	44.13	56.55	25.9	4.82	7.19	26.2	20.37	14.45	26.2	60.49	60.41	26.3	12.92	63.76
26.9	44.25	56.31	26.9	4.86	6.90	27.2	20.01	14.26	27.2	59.11	60.31	27.3	12.63	63.90
27.9	44.37	56.08	27.9	4.90	6.63	28.2	19.66	14.07	28.2	57.77	60.20	28.3	12.36	64.00
28.9	44.48	55.84	28.9	4.93	6.36	29.2	19.32	13.89	29.2	56.45	60.11	29.3	12.09	64.13
29.9	44.59	55.60	29.9	4.95	6.09	30.1	18.96	13.72	30.2	55.10	60.03	30.3	11.82	64.26
30.9	44.69	55.35	30.9	4.98	5.81	31.1	18.58	13.55	31.2	53.71	59.95	31.3	11.55	64.39
31.9	44.79	55.08	31.9	4.99	5.52	32.1	18.18	13.37	32.2	52.26	59.86	32.3	11.27	64.53
10.76      -10.71			8.55      -8.50			24.61      -24.59			74.76      -74.76			15.93      -15.90		
12 <sup>h</sup> 45 <sup>m</sup> 55°.22			14 <sup>h</sup> 13 <sup>m</sup> 9°.28			18 <sup>h</sup> 5 <sup>m</sup> 0°.43			19 <sup>h</sup> 24 <sup>m</sup> 31°.66			22 <sup>h</sup> 15 <sup>m</sup> 43°.98		
-84° 39'      43''.10			-83° 16'      47''.50			-87° 39'      52''.55			-89° 13'      43''.28			-86° 24'      3''.31		

APPARENT PLACES OF CIRCUMPOLAR STARS

FOR THE UPPER TRANSIT AT WASHINGTON.

ι Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Nov.	12 45	-84 39	Nov.	14 13	-83 16	Nov.	18 5	-87 40	Nov.	19 25	-89 13	Nov.	22 16	-86 24
	s	"		s	"		s	"		s	"		s	"
0.9	44.79	55.08	0.9	4.99	65.52	1.1	18.18	13.37	1.2	52.26	59.86	1.3	11.27	4.53
1.9	44.90	54.80	1.9	5.02	65.22	2.1	17.77	13.18	2.2	50.73	59.77	2.3	10.96	4.67
2.9	45.02	54.52	2.9	5.05	64.90	3.1	17.35	12.97	3.2	49.13	59.66	3.3	10.63	4.81
3.9	45.17	54.23	3.9	5.10	64.56	4.1	16.93	12.73	4.2	47.52	59.52	4.3	10.28	4.93
4.9	45.33	53.95	4.9	5.16	64.23	5.1	16.54	12.47	5.2	45.92	59.35	5.3	9.91	5.03
5.9	45.51	53.68	5.9	5.23	63.90	6.1	16.18	12.18	6.2	44.38	59.16	6.3	9.54	5.10
6.9	45.71	53.44	6.9	5.33	63.59	7.1	15.86	11.89	7.2	42.98	58.94	7.3	9.18	5.14
7.9	45.90	53.22	7.9	5.43	63.29	8.1	15.59	11.60	8.2	41.70	58.72	8.3	8.83	5.16
8.9	46.10	53.03	8.9	5.53	63.02	9.1	15.36	11.32	9.2	40.53	58.50	9.3	8.50	5.16
9.9	46.29	52.86	9.9	5.62	62.77	10.1	15.13	11.06	10.2	39.44	58.31	10.3	8.19	5.17
10.9	46.46	52.70	10.9	5.71	62.55	11.1	14.92	10.82	11.2	38.41	58.12	11.3	7.91	5.18
11.9	46.61	52.53	11.9	5.79	62.32	12.1	14.69	10.60	12.2	37.34	57.97	12.3	7.64	5.22
12.9	46.75	52.35	12.9	5.86	62.08	13.1	14.44	10.39	13.2	36.18	57.82	13.3	7.36	5.28
13.9	46.90	52.15	13.9	5.92	61.82	14.1	14.15	10.16	14.2	34.93	57.68	14.3	7.07	5.34
14.9	47.05	51.92	14.9	5.98	61.54	15.1	13.83	9.92	15.2	33.60	57.51	15.3	6.74	5.42
15.9	47.22	51.68	15.9	6.06	61.25	16.1	13.51	9.66	16.2	32.21	57.32	16.3	6.39	5.48
16.9	47.41	51.45	16.9	6.15	60.94	17.1	13.20	9.37	17.2	30.79	57.11	17.3	6.03	5.52
17.9	47.62	51.22	17.9	6.26	60.63	18.1	12.90	9.05	18.2	29.39	56.87	18.3	5.65	5.54
18.9	47.84	51.01	18.9	6.38	60.33	19.1	12.64	8.72	19.1	28.08	56.62	19.3	5.26	5.53
19.9	48.07	50.81	19.9	6.51	60.04	20.1	12.41	8.39	20.1	26.86	56.35	20.3	4.88	5.52
20.9	48.30	50.64	20.9	6.64	59.77	21.1	12.23	8.05	21.1	25.72	56.08	21.3	4.51	5.47
21.9	48.53	50.49	21.9	6.78	59.52	22.1	12.07	7.72	22.1	24.69	55.80	22.3	4.16	5.42
22.9	48.76	50.35	22.9	6.92	59.29	23.1	11.93	7.41	23.1	23.74	55.54	23.3	3.82	5.36
23.9	48.97	50.22	23.9	7.05	59.07	24.1	11.80	7.11	24.1	22.85	55.28	24.3	3.50	5.29
24.9	49.18	50.10	24.9	7.18	58.86	25.1	11.67	6.82	25.1	21.97	55.03	25.3	3.19	5.24
25.9	49.39	49.98	25.9	7.31	58.65	26.1	11.55	6.55	26.1	21.11	54.80	26.2	2.90	5.19
26.9	49.58	49.86	26.9	7.42	58.45	27.1	11.42	6.28	27.1	20.23	54.58	27.2	2.61	5.15
27.8	49.78	49.73	27.9	7.54	58.24	28.1	11.26	6.01	28.1	19.30	54.35	28.2	2.31	5.12
28.8	49.98	49.59	28.9	7.65	58.02	29.1	11.10	5.73	29.1	18.32	54.12	29.2	2.00	5.09
29.8	50.19	49.44	29.9	7.77	57.78	30.1	10.92	5.43	30.1	17.28	53.88	30.2	1.66	5.07
30.8	50.41	49.29	30.9	7.91	57.54	31.1	10.75	5.11	31.1	16.21	53.61	31.2	1.31	5.02
31.8	50.65	49.14	31.9	8.05	57.29	32.1	10.60	4.77	32.1	15.16	53.33	32.2	0.94	4.96
10.75	-10.71		8.55	-8.49		24.59	-24.57		74.67	-74.66		15.93	-15.90	
2 <sup>h</sup> 45 <sup>m</sup>	55 <sup>s</sup> .22		14 <sup>h</sup> 13 <sup>m</sup>	9 <sup>s</sup> .28		18 <sup>h</sup> .5 <sup>m</sup>	0 <sup>s</sup> .43		19 <sup>h</sup> 24 <sup>m</sup>	31 <sup>s</sup> .66		22 <sup>h</sup> 15 <sup>m</sup>	43 <sup>s</sup> .98	
4° 39'	43''.10		-83° 16'	47''.50		-87° 39'	52''.55		-89° 13'	43''.28		-86° 24'	3''.31	

APPARENT PLACES OF CIRCUMPOLAR STARS  
FOR THE UPPER TRANSIT AT WASHINGTON.

ζ Octantis. Mag. 5.4			δ Octantis. Mag. 4.1			χ Octantis. Mag. 5.2			σ Octantis. Mag. 5.5			υ Octantis. Mag. 5.7		
Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.	Mean Solar Date.	Right Ascen- sion.	Decli- nation South.
	h m	° '		h m	° '		h m	° '		h m	° '		h m	° '
Dec.	12 45	-84 39	Dec.	14 13	-83 16	Dec.	18 5	-87 39	Dec.	19 25	-89 13	Dec.	22 15	-86 23
	s	"		s	"		s	"		s	"		s	"
0.8	50.41	49.29	0.9	7.91	57.54	1.1	10.75	65.11	1.1	16.21	53.61	1.2	61.31	65.02
1.8	50.65	49.14	1.9	8.05	57.29	2.1	10.60	64.77	2.1	15.16	53.33	2.2	60.94	64.96
2.8	50.91	49.00	2.9	8.21	57.04	3.1	10.48	64.41	3.1	14.18	53.00	3.2	60.56	64.87
3.8	51.18	48.89	3.9	8.39	56.81	4.1	10.40	64.03	4.1	13.30	52.66	4.2	60.19	64.75
4.8	51.46	48.80	4.9	8.58	56.59	5.0	10.37	63.66	5.1	12.56	52.30	5.2	59.83	64.59
5.8	51.73	48.75	5.9	8.77	56.41	6.0	10.39	63.29	6.1	11.97	51.97	6.2	59.50	64.43
6.8	51.99	48.72	6.9	8.96	56.26	7.0	10.44	62.95	7.1	11.50	51.63	7.2	59.20	64.35
7.8	52.23	48.71	7.9	9.14	56.13	8.0	10.50	62.63	8.1	11.10	51.32	8.2	58.92	64.08
8.8	52.47	48.69	8.9	9.31	56.00	9.0	10.55	62.34	9.1	10.71	51.03	9.2	58.66	63.93
9.8	52.69	48.66	9.9	9.46	55.88	10.0	10.58	62.06	10.1	10.27	50.76	10.2	58.41	63.80
10.8	52.90	48.62	10.9	9.61	55.74	11.0	10.57	61.78	11.1	9.74	50.48	11.2	58.14	63.69
11.8	53.12	48.56	11.9	9.75	55.59	12.0	10.54	61.49	12.1	9.13	50.21	12.2	57.85	63.99
12.8	53.35	48.49	12.9	9.91	55.41	13.0	10.51	61.18	13.1	8.45	49.93	13.2	57.55	63.48
13.8	53.59	48.42	13.9	10.07	55.22	14.0	10.46	60.85	14.1	7.73	49.62	14.2	57.22	63.36
14.8	53.85	48.35	14.9	10.25	55.03	15.0	10.44	60.49	15.1	7.04	49.28	15.2	56.88	63.21
15.8	54.13	48.29	15.9	10.45	54.85	16.0	10.45	60.11	16.1	6.41	48.92	16.2	56.53	63.04
16.8	54.41	48.25	16.9	10.65	54.67	17.0	10.50	59.72	17.1	5.87	48.56	17.2	56.19	62.85
17.8	54.70	48.23	17.9	10.86	54.52	18.0	10.58	59.34	18.1	5.44	48.19	18.2	55.86	62.65
18.8	54.99	48.24	18.9	11.07	54.39	19.0	10.70	58.97	19.1	5.12	47.81	19.2	55.55	62.43
19.8	55.27	48.26	19.9	11.28	54.28	20.0	10.84	58.62	20.1	4.89	47.44	20.2	55.26	62.20
20.8	55.53	48.30	20.8	11.48	54.19	21.0	11.00	58.29	21.1	4.73	47.10	21.2	55.00	61.97
21.8	55.79	48.35	21.8	11.68	54.11	22.0	11.16	57.96	22.1	4.62	46.75	22.2	54.75	61.76
22.8	56.04	48.40	22.8	11.88	54.04	23.0	11.32	57.65	23.1	4.53	46.44	23.2	54.51	61.54
23.8	56.28	48.45	23.8	12.07	53.97	23.9	11.48	57.36	24.1	4.45	46.13	24.2	54.28	61.33
24.8	56.51	48.48	24.8	12.25	53.90	24.9	11.62	57.07	25.1	4.33	45.82	25.2	54.04	61.14
25.8	56.74	48.51	25.8	12.42	53.83	25.9	11.75	56.78	26.0	4.16	45.51	26.2	53.80	60.95
26.8	56.98	48.54	26.8	12.60	53.74	26.9	11.87	56.48	27.0	3.95	45.20	27.2	53.55	60.76
27.8	57.22	48.55	27.8	12.79	53.64	27.9	11.98	56.16	28.0	3.69	44.87	28.2	53.28	60.56
28.8	57.49	48.57	28.8	12.99	53.53	28.9	12.11	55.81	29.0	3.44	44.52	29.2	52.99	60.34
29.8	57.77	48.60	29.8	13.20	53.43	29.9	12.26	55.45	30.0	3.23	44.15	30.2	52.70	60.10
30.8	58.06	48.64	30.8	13.42	53.33	30.9	12.45	55.07	31.0	3.12	43.76	31.2	52.41	59.83
31.8	58.35	48.72	31.8	13.66	53.26	31.9	12.68	54.70	32.0	3.15	43.37	32.1	52.13	59.54
10.75      -10.70			8.55      -8.49			24.56      -24.54			74.45      -74.44			15.93      -15.90		
12 <sup>h</sup> 45 <sup>m</sup> 55 <sup>s</sup> .22			14 <sup>h</sup> 13 <sup>m</sup> 9 <sup>s</sup> .28			18 <sup>h</sup> 5 <sup>m</sup> 0 <sup>s</sup> .43			19 <sup>h</sup> 24 <sup>m</sup> 31 <sup>s</sup> .66			22 <sup>h</sup> 15 <sup>m</sup> 43 <sup>s</sup> .98		
-84° 39'      43''.10			-83° 16'      47''.50			-87° 39'      52''.55			-89° 13'      43''.28			-86° 24'      3''.31		

AN ERRORS OF



FOR 1920 OF STARS OF THE AMERICAN  
NUTICAL ALMANAC.

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON

1 ERRORS OF

OF STARS OF THE AMERICAN  
ALMANAC.



AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Date.	Culmination.	Mean Time of Transit.		Diff. for 1 Hour of Long.	Right Ascension of Center.			Diff. for 1 Hour of Long.	Geocentric Declination of Center.			Diff. for 1 Hour of Long.	Sid. Time of Semid. Passing Meridian.	Geocentric Semidiameter.	Equatorial Horizontal Parallax.	Bright Limbs.	
		h	m	m	h	m	s	s	°	'	"	"	s	'	"	'	"
Apr. 23	L	19	45.29	1.954	9	51	10.19	127.43	+12	51	34.7	- 858.7	66.49	15 39.2	57 20.9	I.	N.
24	U	8	8.69	1.948	10	16	36.38	127.04	9	54	2.4	915.2	66.36	15 47.2	57 50.4	I.	N.
24	L	20	32.08	1.952	10	42	1.75	127.31	6	46	6.2	962.4	66.41	15 55.4	58 20.4	I.	N.
25	U	8	55.59	1.969	11	7	34.77	128.32	3	29	45.1	999.1	66.65	16 3.5	58 50.2	I.	N.
25	L	21	19.39	1.999	11	33	24.74	130.15	+ 0	7	14.5	-1023.8	67.10	16 11.4	59 19.3	I.	N.
26	U	9	43.63	2.044	11	59	41.66	132.82	- 3	18	51.4	1034.7	67.78	16 18.9	59 46.7	I.	N.
26	L	22	8.50	2.103	12	26	35.91	136.36	6	45	35.7	1029.9	68.68	16 25.7	60 11.8	I.	N.
27	U	10	34.15	2.176	12	54	17.78	140.75	10	9	37.2	1007.2	69.79	16 31.7	60 33.8	I.	N.
27	L	23	0.76	2.261	13	22	56.92	145.88	-13	27	9.1	- 964.6	71.09	16 36.7	60 51.9	I.	N.S.
28	U	11	28.46	2.356	13	52	41.42	151.60	16	34	1.7	900.4	72.51	16 40.4	61 5.5	I.	S.
28	L	23	57.33	2.456	14	23	36.65	157.61	19	25	47.9	813.4	73.98	16 42.7	61 14.1	I.	II. S.
29	U	12	27.39	2.554	14	55	43.81	163.51	21	57	54.1	703.8	75.41	16 43.6	61 17.5	II.	S.
30	L	0	58.58	2.641	15	28	58.51	168.77	-24	5	55.9	- 573.1	76.69	16 43.1	61 15.5	II.	S.
30	U	13	30.71	2.709	16	3	9.65	172.83	25	45	58.7	424.8	77.67	16 41.1	61 8.3	II.	S.
May 1	L	2	3.48	2.747	16	37	59.39	175.13	26	55	1.5	264.2	78.24	16 37.9	60 56.3	II.	S.
1	U	14	36.50	2.750	17	13	4.41	175.32	27	31	17.5	- 98.2	78.31	16 33.4	60 39.9	II.	S.
2	L	3	9.34	2.717	17	47	58.55	173.34	-27	34	25.5	+ 65.9	77.87	16 27.9	60 19.9	II.	S.
2	U	15	41.58	2.651	18	22	16.37	169.33	27	5	31.3	221.2	76.97	16 21.7	59 57.0	II.	N.S.
3	L	4	12.85	2.558	18	55	36.29	163.76	26	6	54.0	362.3	75.67	16 14.8	59 31.9	II.	N.
3	U	16	42.91	2.449	19	27	42.91	157.21	24	41	45.6	486.0	74.10	16 7.6	59 5.4	II.	N.
4	L	5	11.61	2.333	19	58	27.61	150.21	-22	53	45.5	+ 590.9	72.39	16 0.2	58 38.2	II.	N.
4	U	17	38.90	2.217	20	27	48.09	143.24	20	46	40.2	677.0	70.64	15 52.8	58 10.9	II.	N.
5	L	6	4.84	2.108	20	55	47.07	136.67	18	24	7.4	745.6	68.95	15 45.5	57 44.1	II.	N.
5	U	18	29.53	2.009	21	22	30.90	130.75	15	49	26.2	798.6	67.39	15 38.4	57 18.1	II.	N.
6	L	6	53.12	1.924	21	48	8.11	125.60	-13	5	34.0	+ 837.8	65.99	15 31.6	56 53.3	II.	N.
6	U	19	15.76	1.852	22	12	48.45	121.28	10	15	6.0	864.9	64.79	15 25.2	56 29.9	II.	N.
7	L	7	37.62	1.794	22	36	42.13	117.83	7	20	16.7	881.6	63.82	15 19.3	56 8.1	II.	N.
7	U	19	58.88	1.751	22	59	59.39	115.21	4	23	4.9	889.0	63.05	15 13.8	55 48.0	II.	N.
8	L	8	19.70	1.721	23	22	50.16	113.40	- 1	25	14.9	+ 888.0	62.51	15 8.8	55 29.7	II.	N.
8	U	20	40.23	1.704	23	45	23.93	112.36	+ 1	31	37.8	879.5	62.19	15 4.3	55 13.1	II.	N.
9	L	9	0.63	1.699	0	7	49.77	112.07	4	26	4.5	863.7	62.07	15 0.3	54 58.2	II.	N.
9	U	21	21.05	1.705	0	30	16.13	112.45	7	16	39.5	840.9	62.15	14 56.7	54 45.1	II.	N.
10	L	9	41.60	1.722	0	52	50.93	113.46	+10	1	58.6	+ 811.1	62.41	14 53.6	54 33.6	II.	N.
10	U	22	2.41	1.748	1	15	41.40	115.04	12	40	36.9	774.1	62.82	14 50.9	54 23.7	II.	N.
11	L	10	23.59	1.783	1	38	54.03	117.14	15	11	7.0	729.8	63.38	14 48.6	54 15.4	II.	N.
11	U	22	45.23	1.825	2	2	34.39	119.66	17	31	59.4	677.8	64.05	14 46.7	54 8.5	II.	N.
12	L	11	7.41	1.872	2	26	46.94	122.49	+19	41	41.8	+ 618.0	64.81	14 45.2	54 3.0		
12	U	23	30.17	1.922	2	51	34.70	125.50	21	38	39.7	550.3	65.62	14 44.1	53 59.0		
13	L	11	53.54	1.973	3	16	59.11	128.55	23	21	18.8	474.9	66.44	14 43.4	53 56.4		
14	U	0	17.52	2.022	3	42	59.62	131.48	24	48	7.4	392.0	67.22	14 43.1	53 55.2		
14	L	12	42.05	2.065	4	9	33.65	134.11	+25	57	39.7	+ 302.4	67.93	14 43.2	53 55.5		
15	U	1	7.05	2.101	4	36	36.49	136.27	26	48	40.3	207.0	68.51	14 43.7	53 57.3	I.	S.
15	L	13	32.43	2.126	5	4	1.52	137.80	27	20	7.8	107.1	68.93	14 44.6	54 0.6	I.	S.
16	U	1	58.04	2.140	5	31	40.60	138.59	27	31	19.4	+ 4.5	69.16	14 45.9	54 5.6	I.	S.
16	L	14	23.74	2.141	5	59	24.83	138.64	+27	21	52.9	- 99.0	69.21	14 47.8	54 12.3	I.	S.

May 2, U Defective Illumination of N. 0''.11.

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Date

May 1

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June

TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Culmination.	Mean Time of Transit.	Diff. for 1 Hour of Long.	Right Ascension of Center.	Diff. for 1 Hour of Long.	Geocentric Declination of Center.	Diff. for 1 Hour of Long.	Sid. Time of Semid. Pass- ing Me- ridian.	Geocen- tric Semidi- ameter.	Equa- torial Hori- zontal Parallax.	Bright Limbs.
	h m	m	h m s	s	° ' "	"	s	' "	' "	
L	9 5.61	1.840	2 11 5.73	120.54	+18 26 50.5	+649.4	64.39	14 46.6	54 8.1	II. N.
U	21 27.97	1.888	2 35 29.23	123.44	20 30 35.7	586.8	65.16	14 45.1	54 2.4	II. N.
L	9 50.92	1.939	3 0 28.79	126.52	22 21 4.4	516.6	65.96	14 44.0	53 58.6	II. N.
U	22 14.50	1.991	3 26 5.68	129.62	23 56 45.7	438.8	66.77	14 43.5	53 56.5	II. N.
L	10 38.69	2.040	3 52 19.04	132.56	+25 16 9.7	+353.8	67.52	14 43.4	53 56.1	II. S.
U	23 3.43	2.083	4 19 5.76	135.15	26 17 52.4	262.2	68.18	14 43.7	53 57.3	
L	11 28.63	2.117	4 46 20.51	137.21	27 0 40.6	165.0	68.70	14 44.4	54 0.0	
U	23 54.18	2.140	5 13 55.93	138.58	27 23 35.9	+ 63.8	69.05	14 45.5	54 4.2	
L	12 19.93	2.149	5 41 43.13	139.17	+27 26 0.1	- 39.8	69.20	14 47.0	54 9.7	
U	0 45.71	2.146	6 9 32.51	138.94	27 7 37.1	143.8	69.15	14 48.9	54 16.6	
L	13 11.37	2.129	6 37 14.48	137.95	26 28 35.2	246.1	68.92	14 51.2	54 24.8	I. S.
U	1 36.76	2.101	7 4 40.44	136.29	25 29 25.5	344.8	68.51	14 53.8	54 34.3	I. S.
L	14 1.77	2.066	7 31 43.45	134.14	+24 10 59.8	-438.5	67.97	14 56.7	54 45.2	I. N.
U	2 26.32	2.025	7 58 18.69	131.69	22 34 26.6	526.0	67.36	15 0.1	54 57.5	I. N.
L	14 50.37	1.983	8 24 23.72	129.14	20 41 6.3	606.2	66.71	15 3.8	55 11.1	I. N.
U	3 13.91	1.942	8 49 58.42	126.68	18 32 27.3	678.9	66.09	15 7.9	55 26.2	I. N.
L	15 36.98	1.905	9 15 4.91	124.46	+16 10 2.2	-743.8	65.52	15 12.4	55 42.7	I. N.
U	3 59.65	1.875	9 39 47.13	122.65	13 35 25.9	800.8	65.06	15 17.3	56 0.7	I. N.
L	16 22.01	1.854	10 4 10.67	121.38	10 50 14.2	849.8	64.74	15 22.6	56 20.1	I. N.
U	4 44.18	1.843	10 28 22.51	120.72	7 56 3.5	890.7	64.58	15 28.2	56 40.8	I. N.
L	17 6.28	1.844	10 52 30.67	120.77	+ 4 54 32.1	-923.1	64.61	15 34.2	57 2.9	I. N.
U	5 28.47	1.858	11 16 44.20	121.63	+ 1 47 22.3	946.9	64.86	15 40.6	57 26.1	I. N.
L	17 50.92	1.886	11 41 12.91	123.32	- 1 23 36.6	961.2	65.32	15 47.1	57 50.2	I. N.
U	6 13.79	1.929	12 6 7.34	125.91	4 36 25.0	965.0	66.03	15 53.9	58 14.9	I. N.
L	18 37.28	1.988	12 31 38.47	129.45	- 7 48 48.5	-956.8	66.97	16 0.7	58 39.9	I. N.
U	7 1.56	2.062	12 57 57.58	133.91	10 58 14.5	935.1	68.14	16 7.4	59 4.7	I. N.
L	19 26.82	2.151	13 25 15.77	139.27	14 1 47.3	897.7	69.52	16 14.0	59 28.8	I. N.
U	7 53.23	2.253	13 53 43.22	145.42	16 56 6.3	842.4	71.08	16 20.2	59 51.6	I. N.
L	20 20.94	2.365	14 23 28.21	152.14	-19 37 25.3	-767.3	72.73	16 25.9	60 12.5	I. N.
U	8 50.01	2.481	14 54 35.68	159.10	22 1 35.7	670.8	74.41	16 30.9	60 30.6	I. N.
L	21 20.45	2.592	15 27 5.57	165.79	24 4 17.3	552.5	75.99	16 34.9	60 45.5	I. N.
U	9 52.15	2.689	16 0 51.15	171.61	25 41 15.2	413.8	77.34	16 37.9	60 56.5	I. N. S.
L	22 24.87	2.760	16 35 38.04	175.91	-26 48 42.5	-258.3	78.32	16 39.6	61 3.0	I. N. S.
U	10 58.25	2.796	17 11 4.35	178.10	27 23 48.8	- 91.6	78.81	16 40.1	61 4.7	I. S.
L	23 31.83	2.793	17 46 42.78	177.88	27 25 5.0	+ 78.7	78.75	16 39.2	61 1.3	I. S.
U	12 5.12	2.749	18 22 3.97	175.25	26 52 38.2	244.3	78.14	16 36.9	60 52.9	I. II. S.
L	0 37.67	2.671	18 56 40.79	170.57	-25 48 9.6	+397.8	77.04	16 33.3	60 39.8	II. N. S.
U	13 9.13	2.568	19 30 11.63	164.36	24 14 40.2	533.7	75.58	16 28.6	60 22.4	II. N. S.
L	1 39.25	2.451	20 2 22.37	157.32	22 16 3.8	648.6	73.90	16 22.8	60 1.1	II. N. S.
U	14 7.94	2.330	20 33 6.42	150.02	19 56 40.6	741.5	72.12	16 16.2	59 36.7	II. N.
L	2 35.18	2.212	21 2 23.88	142.96	-17 20 51.4	+813.1	70.36	16 8.9	59 10.1	II. N.
U	15 1.07	2.104	21 30 19.59	136.45	14 32 42.1	805.2	68.71	16 1.2	58 41.8	II. N.
L	3 25.73	2.009	21 57 1.70	130.71	11 35 53.9	900.1	67.23	15 53.3	58 12.7	II. N.
U	15 49.34	1.928	22 22 40.16	125.85	8 33 39.4	920.0	65.96	15 45.3	57 43.4	II. N.
L	4 12.06	1.862	22 47 25.78	121.91	- 5 28 43.3	+927.4	64.91	15 37.5	57 14.7	II. N.

ie 24, U Defective Illumination of S. 0''.01.  
ie 26, U Defective Illumination of I. 0''.00.

June 27, U Defective Illumination of N. 8''.05.

FOR WASHINGTON MEAN AND 

NOON.

FOR

MEAN AND APPARENT NOON.



FOR WASHINGTON MEAN AND ~~WASH. MEAN~~ NOON.~~TABLE~~

ANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Mean Time of Transit.	Diff. for 1 Hour of Long.	Right Ascension of Center.	Diff. for 1 Hour of Long.	Geocentric Declination of Center.	Diff. for 1 Hour of Long.	Sid. Time of Semid. Pass- ing Me- ridian.	Geocen- tric Semidi- ameter.	Equa- torial Hori- zontal Parallax.	Bright Limbs.
h m	m	h m s	s	° ' "	"	s	' "	' "	
10 56.84	1.917	10 1 24.61	125.20	+11 0 51.2	-873.6	65.56	15 32.9	56 57.9	II. S.
23 19.77	1.906	10 26 22.36	124.53	8 1 33.7	917.6	65.36	15 38.4	57 18.1	
11 42.62	1.904	10 51 15.34	124.42	4 54 31.9	950.9	65.33	15 43.7	57 37.7	
0 5.51	1.913	11 16 10.96	124.97	+ 1 41 57.9	972.8	65.48	15 48.8	57 56.2	
12 28.58	1.934	11 41 17.23	126.21	- 1 33 47.6	-982.6	65.81	15 53.4	58 13.3	
0 51.97	1.966	12 6 42.67	128.16	4 50 13.8	979.5	66.35	15 57.7	58 28.8	
13 15.82	2.011	12 32 36.01	130.85	8 4 39.8	962.5	67.09	16 1.4	58 42.5	I. N.
1 40.28	2.068	12 59 5.91	134.24	11 14 14.4	930.7	68.01	16 4.6	58 54.2	I. N.
14 5.48	2.135	13 26 20.51	138.29	-14 15 55.1	-883.3	69.09	16 7.2	59 3.9	I. N.
2 31.55	2.210	13 54 26.91	142.86	17 6 30.8	819.8	70.30	16 9.3	59 11.5	I. N.
14 58.56	2.292	14 23 30.41	147.77	19 42 43.3	739.5	71.57	16 10.8	59 17.0	I. N.
3 26.57	2.375	14 53 33.62	152.75	22 1 12.3	642.6	72.85	16 11.8	59 20.6	I. N.
15 55.55	2.454	15 24 35.53	157.48	-23 58 42.4	-529.9	74.05	16 12.3	59 22.4	I. N.
4 25.42	2.522	15 56 30.70	161.56	25 32 13.2	403.1	75.06	16 12.3	59 22.4	I. N.
16 56.00	2.572	16 29 8.85	164.59	26 39 11.6	265.0	75.81	16 11.9	59 20.9	I. N.
5 27.05	2.599	17 2 15.33	166.23	27 17 44.6	-119.6	76.21	16 11.0	59 17.9	I. N.
17 58.27	2.600	17 35 32.02	166.28	-27 26 50.8	+ 28.7	76.23	16 9.9	59 13.6	I. N.S.
6 29.34	2.574	18 8 39.52	164.71	27 6 26.3	174.7	75.84	16 8.3	59 8.0	I. N.S.
18 59.94	2.524	18 41 19.22	161.69	26 17 26.1	313.9	75.09	16 6.5	59 1.3	I. S.
7 29.83	2.454	19 13 15.40	157.52	25 1 36.5	442.4	74.06	16 4.4	58 53.6	I. S.
19 58.80	2.372	19 44 16.56	152.59	-23 21 24.5	+557.2	72.82	16 2.0	58 44.7	I. S.
8 26.74	2.284	20 14 16.00	147.29	21 19 43.4	656.9	71.46	15 59.3	58 34.7	I. S.
20 53.62	2.196	20 43 11.54	141.98	18 59 40.8	740.8	70.08	15 56.3	58 23.7	I. S.
9 19.47	2.112	21 11 4.83	136.95	16 24 27.4	808.8	68.75	15 53.0	58 11.6	I. S.
21 44.35	2.037	21 38 0.35	132.40	-13 37 10.5	+861.5	67.52	15 49.4	57 58.5	I. S.
10 8.39	1.971	22 4 4.61	128.43	10 40 48.3	899.8	66.44	15 45.6	57 44.4	I. S.
22 31.70	1.916	22 29 25.32	125.14	7 38 8.3	924.6	65.53	15 41.5	57 29.4	I. S.
10 54.42	1.874	22 54 10.85	122.57	4 31 46.3	936.9	64.81	15 37.2	57 13.7	I. S.
23 16.70	1.842	23 18 29.75	120.71	- 1 24 7.2	+937.6	64.28	15 32.7	56 57.2	I. N.S.
11 38.68	1.823	23 42 30.51	119.54	+ 1 42 34.7	927.5	63.96	15 28.1	56 40.3	I. N.S.
0 0.50	1.815	0 6 21.30	119.05	4 46 14.1	907.3	63.82	15 23.4	56 23.1	I. II. N.
12 22.28	1.817	0 30 9.89	119.17	7 44 54.2	877.7	63.86	15 18.7	56 5.9	II. N.
0 44.14	1.828	0 54 3.49	119.87	+10 36 44.3	+839.1	64.06	15 14.1	55 48.9	II. N.
13 6.20	1.848	1 18 8.60	121.08	13 20 0.1	792.1	64.42	15 9.6	55 32.4	II. N.
1 28.54	1.876	1 42 30.89	122.72	15 53 1.9	736.9	64.89	15 5.3	55 16.8	II. N.
13 51.24	1.909	2 7 15.07	124.70	18 14 14.7	674.0	65.46	15 1.4	55 2.2	II. N.
2 14.36	1.946	2 32 24.60	126.91	+20 22 7.8	+603.7	66.09	14 57.7	54 48.9	II. N.
14 37.94	1.984	2 58 1.58	129.24	22 15 15.4	526.4	66.75	14 54.6	54 37.3	II. N.
3 1.99	2.023	3 24 6.51	131.55	23 52 17.8	442.9	67.40	14 51.9	54 27.6	II. N.
15 26.48	2.058	3 50 38.20	133.69	25 12 2.0	353.6	68.00	14 49.9	54 20.0	II. N.
3 51.36	2.088	4 17 33.68	135.50	+26 13 25.1	+259.5	68.51	14 48.4	54 14.7	II. N.
16 16.57	2.111	4 44 48.41	136.87	26 55 35.3	161.7	68.90	14 47.6	54 11.8	II. N.
4 42.00	2.125	5 12 16.45	137.71	27 17 54.6	+ 61.3	69.14	14 47.6	54 11.6	II. N.
17 7.53	2.129	5 39 50.94	137.95	27 20 0.6	- 40.3	69.22	14 48.3	54 14.2	II. N.S.
5 33.05	2.123	6 7 24.68	137.58	+27 1 47.3	-141.8	69.13	14 49.7	54 19.5	II. N.S.

U Defective Illumination of N. 0".34.  
U Defective Illumination of S. 0".22.

Sept. 29. U Defective Illumination of S. 0".93.



FOR

MEAN AND APPARENT NOON.

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NOTE.—For mean time interval of semidiameter passing meridian, subtract  $0^s.19$  from the sidereal interval.  
(Eph 15)

TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Mean Time of Transit.	Diff. for 1 Hour of Long.	Right Ascension of Center.	Diff. for 1 Hour of Long.	Geocentric Declination of Center.	Diff. for 1 Hour of Long.	Sid. Time of Semid. Pass- ing Me- ridian.	Geocen- tric Semidi- ameter.	Equa- torial Hori- zontal Parallax.	Bright Limbs.
h m	m	h m s	s	° ' "	"	s	' "	' "	
12 31.90	1.956	2 38 5.16	127.56	+20 41 33.9	+581.3	66.07	14 55.4	54 40.4	II. N.
0 55.62	1.997	3 3 50.65	130.02	22 30 9.5	503.4	66.74	14 52.7	54 30.5	II. N.
13 19.82	2.035	3 30 5.02	132.34	24 2 28.6	418.8	67.39	14 50.4	54 21.9	II. N.
1 44.46	2.070	3 56 45.69	134.37	25 17 16.0	328.3	67.95	14 48.4	54 14.8	II. N.
14 9.46	2.096	4 23 48.31	135.97	+26 13 28.1	+233.1	68.40	14 46.9	54 9.3	II. N.
2 34.73	2.113	4 51 6.92	137.01	26 50 17.1	134.7	68.72	14 46.0	54 5.7	II. N.
15 0.15	2.120	5 18 34.33	137.43	27 7 12.4	+ 34.5	68.86	14 45.5	54 4.1	II. N.
3 25.58	2.117	5 46 2.82	137.21	27 4 1.9	- 66.0	68.84	14 45.7	54 4.7	II. N.
15 50.91	2.102	6 13 24.67	136.34	+26 40 52.2	-165.2	68.65	14 46.5	54 7.7	II. N. S.
4 16.00	2.079	6 40 32.87	134.94	25 58 7.6	261.7	68.32	14 48.0	54 13.1	II. N. S.
16 40.78	2.049	7 7 21.76	133.14	24 56 27.2	354.3	67.87	14 50.2	54 21.1	II. S.
5 5.17	2.015	7 33 47.34	131.09	23 36 42.4	442.3	67.35	14 53.1	54 31.8	II. S.
17 29.13	1.979	7 59 47.46	128.94	+21 59 53.1	-525.0	66.78	14 56.7	54 45.2	II. S.
5 52.67	1.945	8 25 22.01	126.86	20 7 6.0	601.9	66.23	15 1.1	55 1.2	II. S.
18 15.81	1.913	8 50 32.62	124.98	17 59 31.5	672.8	65.72	15 6.2	55 19.8	II. S.
6 38.61	1.888	9 15 22.65	123.44	15 38 23.1	737.5	65.29	15 11.9	55 40.8	II. S.
19 1.15	1.870	9 39 56.87	122.36	+13 4 56.7	-795.8	64.98	15 18.2	56 4.1	II. S.
7 23.53	1.861	10 4 21.36	121.83	10 20 32.0	847.2	64.81	15 25.1	56 29.5	II. S.
19 45.86	1.863	10 28 43.23	121.94	7 26 33.9	891.3	64.82	15 32.5	56 56.5	II. S.
8 8.28	1.876	10 53 10.51	122.75	4 24 34.7	927.2	65.01	15 40.2	57 24.7	II. S.
20 30.94	1.902	11 17 52.05	124.32	+ 1 16 18.2	-953.9	65.40	15 48.0	57 53.7	II. S.
8 54.00	1.942	11 42 57.32	126.70	- 1 56 17.3	970.2	66.01	15 56.0	58 22.8	II. S.
21 17.61	1.996	12 8 36.29	129.93	5 10 55.8	974.2	66.85	16 3.8	58 51.4	II. S.
9 41.95	2.064	12 34 59.18	134.02	8 24 58.8	963.9	67.90	16 11.3	59 18.8	II. S.
22 7.19	2.145	13 2 15.99	138.92	-11 35 23.5	-937.3	69.14	16 18.2	59 44.2	II. S.
10 33.48	2.238	13 30 36.01	144.53	14 38 40.7	892.3	70.55	16 24.4	60 6.9	II. S.
23 0.95	2.341	14 0 6.81	150.67	17 30 57.0	826.9	72.08	16 29.6	60 26.1	
11 29.67	2.447	14 30 53.07	157.04	20 7 59.1	739.8	73.64	16 33.8	60 41.3	
23 59.65	2.549	15 2 55.21	163.23	-22 25 24.4	-630.8	75.14	16 36.7	60 52.0	
12 30.81	2.640	15 36 7.87	168.70	24 18 57.1	501.4	76.45	16 38.3	60 57.8	
1 2.93	2.710	16 10 19.00	172.89	25 44 48.9	354.8	77.45	16 38.5	60 58.7	I. N.
13 35.72	2.749	16 45 9.93	175.27	26 40 3.7	196.2	78.03	16 37.4	60 54.8	I. N.
2 8.77	2.753	17 20 16.76	175.50	-27 2 57.3	- 32.5	78.13	16 35.1	60 46.3	I. N.
14 41.65	2.721	17 55 13.14	173.53	26 53 12.6	+128.9	77.70	16 31.7	60 33.7	I. N.
3 13.94	2.655	18 29 33.82	169.61	26 11 57.8	281.4	76.81	16 27.3	60 17.5	I. N.
15 45.28	2.565	19 2 57.82	164.18	25 1 34.8	419.6	75.55	16 22.1	59 58.4	I. S.
4 15.43	2.459	19 35 10.40	157.81	-23 25 17.8	+540.1	74.04	16 16.3	59 37.1	I. S.
16 44.27	2.347	20 6 3.67	151.05	21 26 49.3	641.5	72.40	16 10.1	59 14.3	I. S.
5 11.76	2.236	20 35 35.97	144.38	19 9 58.8	723.9	70.74	16 3.6	58 50.6	I. S.
17 37.96	2.132	21 3 50.52	138.14	16 38 27.0	788.5	69.14	15 57.0	58 26.5	I. S.
6 2.98	2.040	21 30 53.98	132.56	-13 55 37.8	+837.0	67.69	15 50.5	58 2.5	I. S.
18 26.97	1.960	21 56 55.19	127.78	11 4 32.7	871.0	66.41	15 44.1	57 39.1	I. S.
6 50.08	1.895	22 22 4.05	123.84	8 7 53.0	892.9	65.33	15 37.9	57 16.4	I. S.
19 12.49	1.844	22 46 30.92	120.78	5 7 59.4	904.0	64.46	15 32.0	56 54.7	I. S.
7 34.38	1.807	23 10 26.06	118.56	- 2 6 56.8	+905.0	63.84	15 26.4	56 34.2	I. S.

Oct. 27, U Defective Illumination of S. 0''.01.

[Eph 15]

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Date.	Culmination.	Mean Time of Transit.	Diff. for 1 Hour of Long.	Right Ascension of Center.	Diff. for 1 Hour of Long.	Geocentric Declination of Center.	Diff. for 1 Hour of Long.	Sid. Time of Semid. Pass- ing Me- ridian.	Geocen- tric Semidi- ameter.	Equa- torial Hori- zontal Parallax.	Bright Limbs.
		h m	m	h m s	s	° ' "	"	s	' "	' "	
Nov. 15	L	19 55.91	1.783	23 33 59.46	117.16	+ 0 53 22.3	+896.9	63.42	15 21.2	56 14.9	I. S
16	U	8 17.23	1.773	23 57 20.57	116.51	3 51 15.0	880.6	63.20	15 16.3	55 56.9	I. S
16	L	20 38.49	1.774	0 20 38.27	116.58	6 45 3.9	856.3	63.19	15 11.8	55 40.3	I. S
17	U	8 59.84	1.786	0 44 0.80	117.29	9 33 14.8	824.3	63.36	15 7.6	55 25.0	I. S
17	L	21 21.39	1.807	1 7 35.55	118.59	+12 14 15.5	+784.5	63.69	15 3.8	55 11.0	I. S
18	U	9 43.25	1.837	1 31 29.02	120.40	14 46 32.6	737.0	64.15	15 0.3	54 58.3	I. S
18	L	22 5.51	1.874	1 55 46.65	122.61	17 8 32.4	681.6	64.72	14 57.1	54 46.7	I. S
19	U	10 28.24	1.915	2 20 32.56	125.09	19 18 41.2	618.4	65.37	14 54.3	54 36.4	I. N.S.
19	L	22 51.49	1.959	2 45 49.30	127.71	+21 15 24.8	+547.5	66.06	14 51.8	54 27.2	I. N.S.
20	U	11 15.26	2.002	3 11 37.66	130.33	22 57 12.1	469.1	66.74	14 49.6	54 19.1	I. N.S.
20	L	23 39.53	2.043	3 37 56.40	132.75	24 22 37.6	384.0	67.38	14 47.8	54 12.3	I. II.N.
21	U	12 4.25	2.077	4 4 42.18	134.81	25 30 24.7	292.9	67.92	14 46.3	54 6.7	II.N.
22	L	0 29.34	2.102	4 31 49.72	136.35	+26 19 29.9	+197.2	68.33	14 45.1	54 2.4	II.N.
22	U	12 54.67	2.117	4 59 11.98	137.24	26 49 6.4	+ 98.4	68.58	14 44.3	53 59.5	II.N.
23	L	1 20.11	2.120	5 26 40.74	137.43	26 58 47.3	- 1.8	68.65	14 43.9	53 58.1	II.N.
23	U	13 45.51	2.111	5 54 7.27	136.88	26 48 26.6	101.6	68.53	14 43.9	53 58.2	II.N.
24	L	2 10.73	2.091	6 21 23.10	135.66	+26 18 19.9	-199.2	68.25	14 44.4	54 0.0	II.N.S.
24	U	14 35.66	2.061	6 48 20.80	133.88	25 29 2.3	293.1	67.82	14 45.4	54 3.7	II.N.S.
25	L	3 0.18	2.025	7 14 54.39	131.66	24 21 24.8	382.3	67.27	14 46.9	54 9.3	II. S
25	U	15 24.23	1.984	7 40 59.97	129.22	22 56 31.3	465.7	66.67	14 49.0	54 17.0	II. S
26	L	3 47.79	1.942	8 6 35.67	126.73	+21 15 34.0	-542.8	66.03	14 51.7	54 26.9	II. S
26	U	16 10.86	1.903	8 31 41.73	124.33	19 19 49.5	613.5	65.41	14 55.0	54 39.0	II. S
27	L	4 33.47	1.867	8 56 20.32	122.17	17 10 36.5	677.6	64.86	14 59.0	54 53.5	II. S
27	U	16 55.69	1.837	9 20 35.25	120.40	14 49 13.9	735.1	64.40	15 3.6	55 10.4	II. S
28	L	5 17.60	1.816	9 44 31.83	119.13	+12 17 0.1	-786.1	64.06	15 8.8	55 29.7	II. S
28	U	17 39.31	1.805	10 8 16.57	118.44	9 35 13.2	830.7	63.88	15 14.7	55 51.3	II. S
29	L	6 0.96	1.804	10 31 56.97	118.42	6 45 12.1	868.4	63.88	15 21.2	56 15.1	II. S
29	U	18 22.67	1.816	10 55 41.51	119.13	3 48 20.1	899.0	64.08	15 28.3	56 40.9	II. S
30	L	6 44.60	1.842	11 19 39.38	120.65	+ 0 46 6.2	-921.8	64.49	15 35.8	57 8.4	II. S
30	U	19 6.92	1.881	11 44 0.58	123.04	- 2 19 49.7	935.8	65.12	15 43.7	57 37.4	II. S
Dec. 1	L	7 29.80	1.935	12 8 55.64	126.31	5 27 33.5	939.6	65.98	15 51.8	58 7.3	II. S
1	U	19 53.43	2.005	12 34 35.56	130.51	8 34 51.9	931.2	67.08	16 0.1	58 37.6	II. S
2	L	8 17.99	2.090	13 1 11.45	135.63	-11 39 7.9	-908.7	68.39	16 8.3	59 7.7	II. S
2	U	20 43.66	2.190	13 28 54.02	141.59	14 37 16.9	869.7	69.90	16 16.2	59 36.7	II. S
3	L	9 10.59	2.301	13 57 52.75	148.27	17 25 44.5	811.5	71.56	16 23.6	60 4.0	II. S
3	U	21 38.91	2.419	14 28 14.68	155.41	20 0 28.4	732.0	73.29	16 30.3	60 28.7	II. S
4	L	10 8.66	2.538	15 0 2.84	162.58	-22 17 4.1	-630.1	75.01	16 36.1	60 49.8	II. S
4	U	22 39.80	2.649	15 33 14.45	169.22	24 10 59.0	505.5	76.57	16 40.7	61 6.7	II. S
5	L	11 12.16	2.740	16 7 39.50	174.69	25 37 53.7	360.6	77.84	16 44.0	61 18.7	II. S
5	U	23 45.44	2.801	16 42 59.99	178.35	26 34 9.2	199.9	78.68	16 45.8	61 25.3	II. S
6	L	12 19.22	2.823	17 18 50.89	179.71	-26 57 16.4	- 30.4	79.00	16 46.0	61 26.3	II. S
7	U	0 53.02	2.804	17 54 43.08	178.56	26 46 17.8	+139.5	78.74	16 44.7	61 21.5	I. N.
7	L	13 26.36	2.746	18 30 6.96	175.05	26 1 58.2	301.7	77.95	16 41.9	61 11.3	I. N.
8	U	1 58.80	2.656	19 4 36.93	169.66	24 46 34.4	449.2	76.72	16 37.8	60 56.1	I. S
8	L	14 30.03	2.546	19 37 54.09	163.03	-23 3 34.7	+577.2	75.17	16 32.5	60 36.7	I. S

Nov. 19, U Defective Illumination of N. 0".19.  
Nov. 20, U Defective Illumination of S. 0".92.

Nov. 24, U Defective Illumination of N. 0".15.

F MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Geocentric Declination of Center.	Diff. for 1 Hour of Long.	Sid Time of Merid. Passing Meridian.	Geocen- tric Semi- diameter.	Equa- torial Hori- zontal Parallax.	Bright Limbs.	
" "	" "	" "	" "	" "		
57 9.0	+083.4	73.45	16 26.2	60 13.7	I	S.
31 41.3	767.6	71 69	16 19 2	59 47.9	I.	S.
51 28.7	831.1	69.99	16 11.7	59 20.3	I.	S.
0 27.5	876.1	68 44	16 3 0	58 51 5	I.	S.
2 6.0	+904 9	67.06	15 55.9	58 22 4	I.	S.
59 25.0	919 8	65.91	15 48 1	57 53 6	I.	S.
54 58.2	922.8	64.98	15 40.4	57 25 4	I.	S.
50 57.9	915 7	64 28	15 33.0	56 58 5	I.	S.
10 42.4	+899.7	63 81	15 26.1	56 33 2	I.	S.
8 22.3	875 8	63 57	15 19.7	56 9.6	I.	S.
0 30.9	844 5	63 53	15 13.8	55 47.9	I.	S.
45 42.3	806.2	63 66	15 8.4	55 28.2	I.	S.
22 33.8	+761.1	63.97	15 3.6	55 10.6	I.	S.
49 43.2	709.2	64.42	14 59.4	54 55.1	I.	S.
5 47 3	650 3	64 97	14 55.7	54 41 6	I.	S.
9 21 9	584.3	65 60	14 52.6	54 30.0	I.	S.
59 2.3	+511 3	66.26	14 49.9	54 20.3	I.	S.
33 25.0	431.4	66.91	14 47.8	54 12.4	I.	S.
51 10.2	345 2	67.51	14 46.1	54 6.2	I.	N. S.
51 6.4	253 4	68.00	14 44.8	54 1 6	I.	N. S.
32 13.6	+157 2	68.37	14 44.0	53 58.5	I.	N. S.
53 48.2	+ 38 2	68.57	14 43.6	53 56.9	I.	N.
55 26.1	- 41 9	68.58	14 43 5	53 56.7	I.	N.
37 4.9	141 4	68.41	14 43.8	53 57 8	I. II.	N. S.
59 4.3	-138.3	68.06	14 44.5	54 0.2	II.	N. S.
2 4.5	331.0	67.57	14 45.5	54 4.0	II.	N. S.
47 3.7	418.2	66.97	14 46.9	54 9.2	II.	N. S.
15 13.1	499.0	66.30	14 48.7	54 15.8	II.	S.
27 54.2	-572 8	65.61	14 50.9	54 23.8	II.	S.
26 33 2	639.3	64.94	14 53.5	54 33.4	II.	S.
12 39.4	698.4	64.34	14 56.6	54 44.6	II.	S.
47 41 4	750.0	63.83	15 0.1	54 57.5	II.	S.
13 6.6	-794.3	63.45	15 4.1	55 12.2	II.	S.
30 21 0	831.9	63.23	15 8.6	55 28.7	II.	S.
40 49.7	862.2	63.18	15 13.6	55 47.0	II.	S.
45 58.4	885 2	63 33	15 19.0	56 7.1	II.	S.
12 44.0	-900 7	63.69	15 25.0	56 29.0	II.	S.
13 42.8	907 8	64.26	15 31.4	56 52.6	II.	S.
15 13.4	905.7	65.07	15 38.3	57 17.7	II.	S.
15 18 3	893.2	66.11	15 45.5	57 44.0	II.	S.
11 41.7	-868 4	67.36	15 52.0	58 11 2	II.	S.
1 45.9	829.6	68.81	16 0.4	58 38 9	II.	S.
42 27.9	774.5	70.44	16 8.0	59 6 6	II.	S.
10 19.2	700.8	72.16	16 15.3	59 33.6	II.	S.
21 26.6	-606 9	73.91	16 22.3	59 50.2	II.	S.

e Illumination of N. 0" 23  
c Illumination of S. 0" 39.

Dec. 21, U Defective Illumination of S. 0" 46.  
Dec. 22, U Defective Illumination of N. 0" 14.

[Eph 15]

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

## FOR TRANSIT AT WASHINGTON.

ate.	Mean Time of Trans- it.	Apparent Right Ascension.	Apparent Declination.	Hor. Par.	Semidiam.	S.T. of Sem. Pass. Mer.	Date.	Mean Time of Trans- it.	Apparent Right Ascension.	Apparent Declination.	Hor. Par.	Semidiam.	S.T. of Sem. Pass. Mer.
	h m	h m s	° ' "	"	"	s		h m	h m s	° ' "	"	"	s
M. 1	22 38	23 17 15.76	- 7 9 36.6	8.0	3.0	0.21	May 17	1 8	4 45 12.50	+24 28 12.8	7.9	3.0	0.22
2	22 39	23 22 43.23	6 37 35.9	7.9	3.0	0.20	18	1 11	4 52 48.26	24 44 50.5	8.1	3.1	0.22
3	22 41	23 28 15.31	6 4 21.9	7.9	3.0	0.20	19	1 15	5 0 12.56	24 59 1.9	8.2	3.1	0.23
4	22 42	23 33 51.96	5 29 55.7	7.8	2.9	0.20	20	1 18	5 7 24.72	25 10 51.2	8.4	3.2	0.23
5	22 44	23 39 33.13	4 54 18.6	7.7	2.9	0.20	21	1 21	5 14 24.11	25 20 23.4	8.5	3.2	0.24
6	22 46	23 45 18.81	- 4 17 32.1	7.6	2.9	0.19	22	1 24	5 21 10.18	+25 27 44.0	8.7	3.3	0.24
7	22 48	23 51 9.02	3 39 37.4	7.5	2.9	0.19	23	1 27	5 27 42.42	25 32 58.8	8.9	3.4	0.25
8	22 50	23 57 3.82	3 0 36.0	7.4	2.8	0.19	24	1 29	5 34 0.34	25 36 13.8	9.1	3.4	0.25
9	22 52	0 3 3.27	2 20 29.2	7.4	2.8	0.19	25	1 31	5 40 3.49	25 37 35.1	9.3	3.5	0.26
10	22 54	0 9 7.46	1 39 18.4	7.3	2.8	0.19	26	1 33	5 45 51.47	25 37 8.8	9.5	3.6	0.27
11	22 56	0 15 16.49	- 0 57 5.2	7.2	2.8	0.18	27	1 34	5 51 23.89	+25 35 1.1	9.7	3.7	0.27
12	22 58	0 21 30.51	- 0 13 51.2	7.2	2.7	0.18	28	1 36	5 56 40.35	25 31 17.9	9.9	3.8	0.28
13	23 1	0 27 49.66	+ 0 30 21.8	7.1	2.7	0.18	29	1 37	6 1 40.48	25 26 5.4	10.2	3.9	0.28
14	23 3	0 34 14.10	1 15 31.8	7.1	2.7	0.18	30	1 38	6 6 23.91	25 19 29.8	10.4	4.0	0.29
15	23 6	0 40 44.03	2 1 36.7	7.0	2.7	0.18	31	1 38	6 10 50.30	25 11 36.9	10.6	4.0	0.30
16	23 8	0 47 19.63	+ 2 48 34.3	6.9	2.6	0.18	June 1	1 38	6 14 59.29	+25 2 32.4	10.9	4.1	0.30
17	23 11	0 54 1.12	3 36 22.0	6.9	2.6	0.18	2	1 38	6 18 50.52	24 52 22.1	11.1	4.2	0.31
18	23 14	1 0 48.72	4 24 56.9	6.9	2.6	0.17	3	1 38	6 22 23.64	24 41 11.8	11.4	4.3	0.32
19	23 17	1 7 42.65	5 14 15.8	6.8	2.6	0.17	4	1 37	6 25 38.32	24 29 7.0	11.7	4.4	0.32
20	23 20	1 14 43.12	6 4 14.9	6.8	2.6	0.17	5	1 36	6 28 34.24	24 16 13.0	11.9	4.5	0.33
21	23 23	1 21 50.35	+ 6 54 50.1	6.7	2.6	0.17	6	1 35	6 31 11.09	+24 2 35.3	12.2	4.6	0.34
22	23 26	1 29 4.53	7 45 56.5	6.7	2.5	0.17	7	1 33	6 33 28.57	23 48 19.1	12.4	4.7	0.34
23	23 30	1 36 25.83	8 37 28.9	6.7	2.5	0.17	8	1 31	6 35 26.43	23 33 29.8	12.7	4.8	0.35
24	23 33	1 43 54.39	9 29 21.2	6.7	2.5	0.17	9	1 29	6 37 4.49	23 18 12.7	13.0	4.9	0.36
25	23 37	1 51 30.28	10 21 26.5	6.6	2.5	0.17	10	1 26	6 38 22.60	23 2 33.0	13.3	5.0	0.36
26	23 41	1 59 13.54	+11 13 37.3	6.6	2.5	0.17	11	1 23	6 39 20.67	+22 46 35.7	13.5	5.1	0.37
27	23 45	2 7 4.14	12 5 45.0	6.6	2.5	0.17	12	1 20	6 39 58.74	22 30 26.0	13.8	5.2	0.38
28	23 49	2 15 1.93	12 57 40.1	6.6	2.5	0.17	13	1 16	6 40 16.92	22 14 9.3	14.0	5.3	0.38
29	23 53	2 23 6.65	13 49 12.4	6.6	2.5	0.17	14	1 12	6 40 15.46	21 57 50.7	14.3	5.4	0.39
30	23 57	2 31 17.96	14 40 10.9	6.6	2.5	0.17	15	1 8	6 39 54.79	21 41 35.6	14.5	5.5	0.40
y 2	0 1	2 39 35.38	+15 30 23.8	6.6	2.5	0.18	16	1 4	6 39 15.47	+21 25 29.3	14.7	5.6	0.40
3	0 6	2 47 58.29	16 19 38.8	6.7	2.5	0.18	17	0 59	6 38 18.26	21 9 37.1	14.9	5.7	0.41
4	0 10	2 56 25.93	17 7 43.4	6.7	2.5	0.18	18	0 54	6 37 4.09	20 54 4.6	15.1	5.7	0.41
5	0 15	3 4 57.42	17 54 24.8	6.7	2.6	0.18	19	0 48	6 35 34.13	20 38 57.6	15.3	5.8	0.41
6	0 20	3 13 31.75	18 39 30.5	6.8	2.6	0.18	20	0 42	6 33 49.77	20 24 21.6	15.5	5.9	0.42
7	0 24	3 22 7.81	+19 22 48.8	6.9	2.6	0.18	21	0 36	6 31 52.62	+20 10 22.3	15.6	5.9	0.42
8	0 29	3 30 44.40	20 4 8.6	6.9	2.6	0.19	22	0 30	6 29 44.47	19 57 5.6	15.7	5.9	0.42
9	0 33	3 39 20.26	20 43 19.9	7.0	2.7	0.19	23	0 24	6 27 27.32	19 44 37.3	15.7	6.0	0.42
10	0 38	3 47 54.12	21 20 14.4	7.1	2.7	0.19	24	0 18	6 25 3.36	19 33 3.0	15.8	6.0	0.42
11	0 43	3 56 24.69	21 54 44.9	7.2	2.7	0.20	25	0 12	6 22 34.89	19 22 28.2	15.8	6.0	0.42
12	0 47	4 4 50.71	+22 26 45.9	7.3	2.8	0.20	26	0 5	6 20 4.33	+19 12 58.0	15.8	6.0	0.42
13	0 52	4 13 10.97	22 56 13.8	7.4	2.8	0.20	26	23 59	6 17 34.15	19 4 37.2	15.7	6.0	0.42
14	0 56	4 21 24.31	23 23 6.4	7.5	2.8	0.21	27	23 52	6 15 6.84	18 57 30.1	15.6	5.9	0.42
15	1 0	4 29 29.66	23 47 23.2	7.6	2.9	0.21	28	23 46	6 12 44.83	18 51 40.4	15.5	5.9	0.41
16	1 4	4 37 26.03	24 9 4.7	7.7	2.9	0.21	29	23 40	6 10 30.47	18 47 11.1	15.3	5.8	0.41
17	1 8	4 45 12.50	+24 28 12.8	7.9	3.0	0.22	30	23 34	6 8 25.99	+18 44 4.2	15.1	5.8	0.40
18	1 11	4 52 48.26	+24 44 50.5	8.1	3.1	0.22	July 1	23 28	6 6 33.47	+18 42 21.1	14.9	5.7	0.40

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

AT TRANSIT OF MOON'S CENTER OVER THE MERIDIAN OF WASHINGTON.

Mar. 23, U Defective Illumination of S. 0".17

33281°—1915—34

Mar. 30, U Defective Illumination of H. 0".02.

[Eph 15]



PATH OF THE ANNULUS DURING THE ANNULAR ECLIPSE OF  
SUN, 1915, FEBRUARY 13.

Green- wich Mean Time	Northern Limit of Annulus Path.		Central Line.		Southern Limit of Annulus Path.		Dur An Ce L
	Latitude.	Longitude from Greenwich.	Latitude.	Longitude from Greenwich.	Latitude.	Longitude from Greenwich.	
Limits.	° ' .	° ' .	° ' .	° ' .	° ' .	° ' .	m
14 <sup>h</sup> 45 <sup>m</sup>	-35 15.3	42 53.0 E.	-35 49.7	42 35.1 E.	-36 24.2	42 16.8 E.	.
50	37 8.9	51 23.7	37 23.0	49 33.4	37 27.1	46 55.8	2
55	39 4.7	64 9.0	39 32.7	63 35.1	40 0.8	62 58.7	2
15 0	39 36.9	71 35.1	40 5.5	71 16.0	40 34.1	70 55.9	2
5	-39 41.2	77 18.4	-40 9.2	77 7.5	-40 37.3	76 56.0	2
10	39 29.6	82 3.8	39 56.8	81 58.4	40 24.0	81 52.6	2
15	39 7.3	86 9.9	39 33.5	86 8.6	39 59.7	86 7.0	2
20	38 37.1	89 47.0	39 2.2	89 48.8	39 27.4	89 50.4	2
25	38 0.8	93 1.2	38 24.9	93 5.5	38 49.1	93 9.6	2
30	37 19.5	95 56.9	37 42.6	96 3.1	38 5.8	96 9.3	2
35	-36 34.2	98 37.2	-36 56.4	98 45.0	-37 18.7	98 52.9	2
40	35 45.6	101 4.3	36 6.9	101 13.5	36 28.3	101 22.7	2
45	34 53.9	103 20.1	35 14.4	103 30.5	35 35.0	103 40.8	2
50	33 59.8	105 26.2	34 19.5	105 37.4	34 39.3	105 48.7	2
55	33 3.4	107 23.6	33 22.4	107 35.7	33 41.4	107 47.7	2
16 0	32 5.0	109 13.6	32 23.3	109 26.3	32 41.7	109 39.0	2
5	-31 4.8	110 57.0	-31 22.5	111 10.3	-31 40.3	111 23.6	2
10	30 3.0	112 34.7	30 20.2	112 48.5	30 37.3	113 2.3	2
15	28 59.7	114 7.3	29 16.3	114 21.5	29 33.0	114 35.7	2
20	27 55.0	115 35.4	28 11.1	115 50.0	28 27.3	116 4.7	2
25	26 48.9	116 59.7	27 4.6	117 14.7	27 20.3	117 29.7	2
30	25 41.5	118 20.7	25 56.8	118 36.0	26 12.2	118 51.4	2
35	-24 32.9	119 38.9	-24 47.8	119 54.5	-25 2.9	120 10.2	2
40	23 23.0	120 54.8	23 37.7	121 10.7	23 52.4	121 26.8	2
45	22 11.9	122 8.8	22 26.3	122 25.0	22 40.8	122 41.4	2
50	20 59.6	123 21.4	21 13.8	123 38.0	21 28.0	123 54.6	2
55	19 46.0	124 33.0	20 0.0	124 49.9	20 14.1	125 7.0	2
17 0	18 31.1	125 44.2	18 45.0	126 1.4	18 58.9	126 18.8	2
5	-17 14.9	126 55.3	-17 28.7	127 12.9	-17 42.5	127 30.7	2
10	15 57.3	128 6.8	16 11.0	128 24.8	16 24.8	128 43.1	2
15	14 38.1	129 19.4	14 51.8	129 37.8	15 5.6	129 56.5	2
20	13 17.3	130 33.5	13 31.1	130 52.4	13 44.9	131 11.6	2
25	11 54.8	131 49.8	12 8.6	132 9.3	12 22.5	132 29.0	2
30	10 30.4	133 9.0	10 44.3	133 29.1	10 58.3	133 49.4	2
35	- 9 3.9	134 32.0	- 9 17.9	134 52.8	- 9 32.0	135 13.8	2
40	7 34.9	135 59.9	7 49.1	136 21.5	8 3.5	136 43.3	2
45	6 3.2	137 33.9	6 17.7	137 56.4	6 32.3	138 19.1	2
50	4 28.3	139 15.8	4 43.1	139 39.4	4 58.0	140 3.2	2
55	2 49.8	141 7.8	3 4.9	141 32.6	3 20.1	141 57.7	2
18 0	- 1 6.6	143 12.8	- 1 22.1	143 39.2	- 1 37.7	144 5.8	2
5	+ 0 42.4	145 35.4	+ 0 26.5	146 3.8	+ 0 10.4	146 32.4	2
10	2 39.0	148 22.8	2 22.7	148 53.8	2 6.1	149 25.2	2
15	4 46.8	151 48.0	4 30.0	152 23.0	4 13.1	152 58.6	2
20	7 12.8	156 19.2	6 56.0	157 1.7	6 39.2	157 45.2	2
Limits.	10 22.1	163 35.6	10 8.6	164 43.0	9 55.9	165 56.6	2
	+13 46.2	174 39.3 E.	+13 9.8	174 53.8 E.	+12 33.3	175 8.5 E.	.



# ANNULAR ECLIPSE

*Note:- The hours of beginning an*

**FEBRUARY 13<sup>TH</sup> 1915.**

*pressed in Greenwich Mean Time*



SELIAN ELEMENTS OF THE ANNULAR ECLIPSE OF THE SUN, 1915,  
AUGUST 10.

Which Mean Time.	Coordinates of Center of Shadow on Fundamental Plane.		Direction of Axis of Shadow.			Radius of Penumbra and Shadow on Fundamental Plane.	
	<i>x</i>	<i>y</i>	Log sin <i>d</i>	Log cos <i>d</i>	$\mu$	<i>h</i> <sub>1</sub>	<i>h</i> <sub>2</sub>
m					° ' "		
50	-1.47199	+0.64791	+9.43296	+9.98344	116 10.2	+0.55487	+0.00891
0	-1.39095	+0.61301	+9.43290	+9.98344	118 40.2	+0.55486	+0.00890
10	1.30991	0.57810	9.43285	9.98345	121 10.2	0.55485	0.00889
20	1.22886	0.54319	9.43280	9.98345	123 40.2	0.55484	0.00888
30	1.14782	0.50826	9.43275	9.98345	126 10.3	0.55484	0.00887
40	1.06677	0.47333	9.43269	9.98346	128 40.3	0.55482	0.00886
50	0.98573	0.43840	9.43264	9.98346	131 10.3	0.55481	0.00885
0	-0.90468	+0.40346	+9.43259	+9.98347	133 40.3	+0.55480	+0.00884
10	0.82363	0.36851	9.43254	9.98347	136 10.4	0.55479	0.00883
20	0.74259	0.33356	9.43249	9.98347	138 40.4	0.55478	0.00882
30	0.66154	0.29860	9.43243	9.98348	141 10.4	0.55477	0.00881
40	0.58049	0.26363	9.43238	9.98348	143 40.5	0.55475	0.00879
50	0.49944	0.22866	9.43233	9.98349	146 10.5	0.55474	0.00878
0	-0.41839	+0.19368	+9.43228	+9.98349	148 40.5	+0.55472	+0.00876
10	0.33735	0.15870	9.43223	9.98350	151 10.5	0.55471	0.00875
20	0.25630	0.12372	9.43217	9.98350	153 40.6	0.55469	0.00873
30	0.17526	0.08872	9.43212	9.98350	156 10.6	0.55468	0.00872
40	0.09421	0.05372	9.43207	9.98351	158 40.6	0.55466	0.00870
50	-0.01317	+0.01872	9.43202	9.98351	161 10.6	0.55464	0.00868
0	+0.06787	-0.01629	+9.43196	+9.98352	163 40.7	+0.55462	+0.00866
10	0.14892	0.05130	9.43191	9.98352	166 10.7	0.55460	0.00864
20	0.22995	0.08632	9.43186	9.98352	168 40.7	0.55458	0.00862
30	0.31099	0.12135	9.43181	9.98353	171 10.8	0.55456	0.00860
40	0.39203	0.15638	9.43175	9.98353	173 40.8	0.55454	0.00858
50	0.47306	0.19141	9.43170	9.98354	176 10.8	0.55452	0.00856
0	+0.55409	-0.22645	+9.43165	+9.98354	178 40.8	+0.55450	+0.00854
10	0.63512	0.26149	9.43160	9.98354	181 10.9	0.55448	0.00852
20	0.71614	0.29654	9.43154	9.98355	183 40.9	0.55445	0.00849
30	0.79717	0.33159	9.43149	9.98355	186 10.9	0.55443	0.00847
40	0.87819	0.36665	9.43144	9.98356	188 40.9	0.55441	0.00845
50	0.95920	0.40171	9.43139	9.98356	191 11.0	0.55438	0.00842
0	+1.04022	-0.43678	+9.43134	+9.98357	193 41.0	+0.55436	+0.00840
10	1.12123	0.47185	9.43128	9.98357	196 11.0	0.55433	0.00837
20	1.20223	0.50692	9.43123	9.98357	198 41.0	0.55430	0.00835
30	1.28323	0.54200	9.43118	9.98358	201 11.1	0.55428	0.00832
40	1.36423	0.57708	9.43113	9.98358	203 41.1	0.55425	0.00829
50	+1.44523	-0.61216	+9.43107	+9.98359	206 11.1	+0.55422	+0.00826

Which Mean Time.	Log <i>x'</i> for 1 Minute.	Log <i>y'</i> for 1 Minute.	Log $\mu'$ for 1 Minute.	Log Tangents of Angles of Cones.	
				Penumbra.	Shadow.
m					
0	+7.9086	-7.5424	+1.1762	+7.66403	+7.66186
0	7.9087	7.5429	1.1762	7.66403	7.66186
0	7.9087	7.5434	1.1762	7.66403	7.66186
0	7.9087	7.5438	1.1762	7.66404	7.66187
0	7.9087	7.5442	1.1762	7.66404	7.66187
0	7.9086	7.5446	1.1762	7.66404	7.66187
0	7.9085	7.5449	1.1762	7.66404	7.66188
0	+7.9084	-7.5452	+1.1762	+7.66405	+7.66188

SUN, 1915, AUGUST 10.

[Eph 15]

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# ANNULAR ECLIPSE

*Note:- The hours of beginning and e*

' AUGUST 10<sup>TH</sup> 1915.

' *expressed in Greenwich Mean Time.*

U.S.N.



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MEAN PLACES FOR 1915.0. (January 0<sup>d</sup>.732, Washington.)

Name of Star.	Magni- tude.	Right Ascension.			Annual Proper Motion.	Declination.			Annual Proper Motion.
		h	m	s		°	'	"	
ium . . .	5.4	0	16	13.390	+0.0003	+	7	43 5.84	+0.016
ium . . .	5.6	0	28	0.570	+0.0021		6	29 10.36	+0.009
ium . . .	6.5	0	36	48.256	-0.0084		8	53 28.82	-0.082
ium . . .	6.3	1	2	5.198	+0.0012		12	30 2.93	+0.042
ium . . .	3.7	1	26	55.924	+0.0015		14	54 28.83	-0.003
ium . . .	6.2	1	31	13.615	+0.0010	+	14	13 38.20	-0.001
ium . . .	6.1	1	35	5.480	+0.0053		15	58 30.03	-0.006
etis . . .	6.4	1	41	58.256	+0.0031		16	59 15.36	+0.015
etis . . .	5.8	1	43	34.117	+0.0035		16	31 58.20	-0.021
etis . . .	5.1	1	52	42.233	+0.0021		17	24 10.70	-0.020
etis . . .	6.4	1	59	2.694	-0.0008	+	17	50 42.79	-0.018
etis . . .	6.5	2	3	5.709	-0.0037		17	37 29.77	-0.007
etis . . .	6.4	2	4	42.760	+0.0112		16	49 34.07	-0.179
etis . . .	5.9	2	5	54.696	+0.0059		19	5 59.00	-0.032
etis . . .	5.6	2	13	23.670	-0.0007		19	30 30.57	-0.003
etis . . .	6.2	2	25	52.191	+0.0050	+	19	28 43.17	-0.022
etis . . .	5.4	2	33	59.203	+0.0001		21	35 39.96	-0.021
etis . . .	5.7	2	37	34.221	+0.0023		19	38 59.97	-0.038
etis (mean)	4.6	2	54	20.884	-0.0009		21	0 3.66	-0.010
etis . . .	5.8	3	19	17.092	+0.0013		24	25 25.65	-0.046
etis . . .	6.1	3	23	28.270	+0.0006	+	22	30 42.33	-0.112
ri . . .	5.9	3	29	24.408	+0.0013		24	10 48.45	-0.023
ri . . .	6.1	3	35	41.512	+0.0014		25	3 19.68	-0.008
ri . . .	5.4	3	39	44.837	+0.0009		24	1 22.24	-0.049
ri . . .	3.8	3	39	49.485	+0.0016		23	50 48.77	-0.050
ri . . .	5.6	3	40	5.203	+0.0004	+	24	34 24.49	-0.038
ri . . .	4.3	3	40	8.665	+0.0010		24	12 5.59	-0.034
ri . . .	4.1	3	40	45.945	+0.0016		24	6 10.70	-0.044
ri . . .	5.8	3	40	50.424	+0.0012		24	17 23.96	-0.046
ri . . .	6.5	3	40	58.866	+0.0006		24	15 48.72	-0.039
ri . . .	4.3	3	41	16.683	+0.0017	+	23	41 3.48	-0.050
ri . . .	3.0	3	42	25.719	+0.0016		23	50 35.18	-0.050
ri . . .	3.7	3	44	6.289	+0.0013		23	47 39.60	-0.048
ri . . .	5.2	3	44	7.575	+0.0009		23	52 40.23	-0.046
ri . . .	5.3	3	45	12.140	+0.0033		25	19 25.88	-0.103
ri . . .	5.6	4	5	39.079	-0.0024	+	26	15 35.98	-0.042
ri . . .	5.0	4	15	7.389	-0.0019		27	8 53.74	-0.082
ri . . .	5.3	4	17	24.460	+0.0028		25	25 46.42	-0.029
igæ . . .	6.0	4	47	28.420	+0.0033		27	45 22.23	-0.037
igæ . . .	6.5	4	59	18.940	-0.0001		27	34 41.41	-0.075
igæ . . .	6.0	5	4	24.623	. . . .	+	27	55 27.19	. . . .
ri . . .	6.4	5	15	38.965	-0.0027		27	52 19.52	-0.015
igæ . . .	6.4	5	17	59.796	+0.0017		28	51 24.17	-0.031
ri . . .	1.8	5	20	55.053	+0.0025		28	32 12.08	-0.177
igæ . . .	6.5	5	30	35.407	-0.0013		27	36 27.56	-0.076
igæ . . .	5.7	5	31	50.228	-0.0004	+	26	52 19.33	-0.039
ri . . .	5.1	5	34	28.117	+0.0018		25	51 1.39	-0.029
ri . . .	5.6	5	45	36.644	-0.0013		27	56 36.54	+0.011
ri . . .	4.6	5	47	59.110	+0.0013		27	35 35.22	-0.020
igæ . . .	6.4	5	51	9.795	. . . .	+	28	55 47.19	. . . .

[Eph 15]



**566      STARS OCCULTED BY THE MOON, 1915.**

**MEAN PLACES FOR 1915.0. (January 0<sup>d</sup>.732, Washington.)**

MEAN PLACES FOR 1915.0. (January 0<sup>d</sup>.732, Washington.)

Name of Star.	Magni- tude.	Right Ascension.	Annual Proper Motion.	Declination.	Annual Proper Motion.
		h m s	s	° ' "	"
Leonis . . .	5.9	10 20 46.588	+0.0017	+ 9 13 2.34	−0.041
Leonis . . .	5.8	10 23 9.725	+0.0011	10 11 46.09	−0.003
Leonis . . .	3.8	10 28 20.236	−0.0004	9 44 39.87	−0.003
Leonis . . .	5.2	10 30 22.039	−0.0072	7 23 29.78	+0.046
Leonis . . .	5.7	10 30 34.704	−0.0030	9 5 23.57	−0.010
Sextantis . . .	6.1	10 38 56.282	+0.0018	+ 5 11 38.88	−0.019
Sextantis . . .	6.3	10 41 40.199	−0.0010	6 49 17.09	−0.040
Leonis . . .	6.1	10 51 36.746	−0.0013	6 38 21.56	−0.007
Leonis . . .	5.0	10 56 10.282	+0.0004	4 4 26.68	−0.022
Leonis . . .	5.1	10 56 20.511	−0.0035	6 33 30.35	−0.025
Leonis . . .	5.7	11 2 34.123	−0.0253	+ 2 25 2.26	−0.080
Leonis . . .	5.4	11 12 54.963	+0.0027	2 28 41.39	−0.145
Leonis . . .	6.0	11 14 33.224	−0.0037	2 7 0.05	−0.053
B. Leonis . . .	6.3	11 18 56.827	−0.0024	0 35 55.69	−0.015
Leonis . . .	5.5	11 19 40.636	−0.0013	+ 1 52 28.34	+0.003
B. Leonis . . .	6.3	11 23 33.122	−0.0025	− 1 13 54.86	+0.007
Leonis . . .	4.5	11 32 35.798	0.0000	0 21 15.61	+0.039
B. Leonis . . .	6.2	11 34 3.451	−0.0028	− 1 57 57.29	+0.047
B. Virginis . . .	6.2	11 44 41.206	−0.0148	+ 0 9 13.53	+0.007
B. Virginis . . .	6.5	12 9 54.175	−0.0051	− 5 14 47.80	+0.114
Virginis . . .	5.3	12 29 23.445	−0.0057	− 8 58 59.43	+0.004
Virginis . . .	4.8	12 34 51.448	−0.0056	7 31 40.65	−0.031
B. Virginis . . .	6.0	12 49 53.186	−0.0058	11 11 16.45	−0.037
Virginis . . .	5.0	12 49 55.837	−0.0023	9 4 39.24	−0.028
Virginis . . .	5.2	13 3 26.498	+0.0007	10 17 10.28	−0.014
Virginis . . .	5.7	13 22 13.578	−0.0096	−12 15 56.08	−0.023
Virginis . . .	4.9	13 22 54.986	−0.0086	15 31 59.26	+0.013
Virginis . . .	5.6	13 28 19.008	−0.0050	14 55 33.59	+0.004
Virginis . . .	5.6	13 39 54.474	+0.0007	15 45 7.07	−0.011
Virginis . . .	6.1	13 41 0.318	−0.0029	15 20 26.86	−0.034
Virginis . . .	5.8	13 42 47.717	+0.0025	−17 26 5.08	−0.046
Virginis . . .	5.1	13 45 14.978	−0.0017	17 42 40.10	−0.040
H. Virginis . . .	5.5	14 10 42.863	−0.0031	17 48 16.43	−0.015
G. Virginis . . .	6.4	14 12 21.634	−0.0005	18 11 26.75	+0.106
G. Virginis . . .	5.7	14 13 56.077	−0.0039	18 19 21.05	−0.001
G. Libræ . . .	6.5	14 30 3.617	+0.0032	−20 4 0.51	−0.004
G. Libræ . . .	6.4	14 41 21.414	−0.0047	20 48 58.01	−0.121
G. Libræ . . .	6.1	14 42 23.478	−0.0032	20 58 7.83	−0.014
B. Libræ . . .	5.7	14 52 29.949	+0.0745	21 1 59.68	−1.792
G. Libræ . . .	6.1	15 1 32.740	+0.0065	21 42 6.15	−0.051
G. Libræ . . .	5.8	15 11 27.164	−0.0028	−22 5 7.63	+0.018
B. Libræ . . .	6.3	15 28 7.014	−0.0006	24 12 5.15	−0.042
Libræ . . .	5.0	15 35 15.184	−0.0018	23 32 33.26	−0.027
Scorpii . . .	4.7	15 45 51.777	−0.0023	25 29 37.65	−0.044
Scorpii . . .	4.6	15 48 30.321	−0.0017	25 4 26.39	−0.023
B. Scorpii . . .	5.4	15 48 49.024	−0.0022	−24 16 50.58	−0.037
Scorpii . . .	5.9	15 49 33.082	−0.0031	24 59 32.92	−0.029
Scorpii . . .	5.7	15 50 21.661	−0.0038	26 0 58.02	−0.028
B. Scorpii . . .	5.4	15 53 28.789	−0.0031	24 35 12.58	+0.004
Scorpii . . .	3.0	15 53 42.394	−0.0010	−25 52 13.02	−0.048

568      STARS OCCULTED BY THE MOON, 1915.

MEAN PLACES FOR 1915.0. (January 0<sup>d</sup>.732, Washington.)

MEAN PLACES FOR 1915.0. (January 0<sup>d</sup>.732, Washington.)



ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
JANUARY.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
JANUARY.

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ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

JANUARY.

THE STAR'S					AT CONJUNCTION IN R. A.					Limit- ing Par- allels.		
Name.	Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	N.	S.	
		Δa	Δδ									
		s	"									°
47 B. Arietis	6.5	+0.74	+10.2	+17 37.7	22	17	41.6	+11 45.3	+0.0639	0.5058	+0.2047	+48-33
20 H <sup>1</sup> . Arietis	6.4	0.76	10.0	16 49.7		18	32.1	-11 25.7	+1.1192	0.5062	0.2036	+90+17
15 Arietis	5.9	0.75	10.8	19 6.2		19	9.4	-10 49.5	-1.2686	0.5065	0.2027	-36-71
θ Arietis	5.6	0.80	11.0	19 30.7		23	1.8	-7 3.9	-0.9464	0.5083	0.1975	-9-70
26 Arietis	6.2	0.88	11.2	19 28.9	23	5	25.2	-0 52.0	+0.3194	0.5116	0.1882	+63-18
ν Arietis	5.4	+0.94	+12.0	+21 35.9		9	32.1	+3 7.5	-1.2611	0.5138	+0.1820	-38-68
μ Arietis	5.7	0.96	11.3	19 39.2		11	20.4	+4 52.5	+1.2176	0.5148	0.1792	+90+39
ε Arietis (mean)	4.6	1.08	11.9	21 0.3		19	41.9	-11 1.5	+1.1626	0.5196	0.1654	+90+36
64 Arietis	5.8	1.25	12.9	24 25.6	24	7	50.8	+0 44.5	-0.7480	0.5268	0.1434	+2-65
7 Tauri	5.9	1.32	12.7	24 11.0		12	41.0	+5 25.4	+0.1928	0.5298	0.1340	+55-18
11 Tauri	6.1	+1.37	+13.0	+25 3.5		15	39.7	+8 18.3	-0.3847	0.5315	+0.1280	+22-47
16 Tauri	5.4	1.39	12.5	24 1.6		17	34.4	+10 9.2	+0.9975	0.5327	0.1241	+90+28
17 Tauri	3.8	1.39	12.5	23 51.0		17	36.6	+10 11.4	+1.1965	0.5327	0.1240	+90+45
18 Tauri	5.6	1.40	12.7	24 34.6		17	44.0	+10 18.5	+0.4088	0.5328	0.1238	+70-5
q Tauri	4.3	1.40	12.6	24 12.3		17	45.6	+10 20.0	+0.8231	0.5328	0.1237	+90+17
20 Tauri	4.1	+1.40	+12.6	+24 6.4		18	3.2	+10 37.1	+0.9681	0.5330	+0.1231	+90+26
21 Tauri	5.8	1.40	12.6	24 17.6		18	5.3	+10 39.1	+0.7658	0.5330	0.1231	+90+14
22 Tauri	6.5	1.40	12.6	24 16.0		18	9.2	+10 42.9	+0.8031	0.5330	0.1229	+90+16
14 H. Tauri	5.3	1.44	12.9	25 19.6		20	8.0	-11 22.2	-0.1294	0.5342	0.1188	+36-32
p Tauri	5.6	1.58	12.8	26 15.8	25	5	36.2	-2 12.9	-0.1336	0.5397	0.0983	+36-31
φ Tauri	5.0	+1.65	+12.8	+27 9.1		9	55.7	+1 57.8	-0.7084	0.5421	+0.0885	+3-63
χ Tauri	5.3	1.66	12.2	25 26.0		10	58.0	+2 58.1	+1.2757	0.5426	0.0861	+72+59
17 B. Aurigæ	6.0	1.87	11.9	27 45.6	26	0	26.9	-8 0.9	-0.3395	0.5493	0.0537	+24-38
38 B. Aurigæ	6.5	1.94	11.4	27 34.9		5	40.8	-2 58.0	+0.1033	0.5515	0.0406	+50-13
47 B. Aurigæ	6.0	1.98	11.3	27 55.6		7	55.1	-0 48.4	-0.1911	0.5524	0.0350	+33-28
354 B. Tauri	6.4	+2.04	+10.8	+27 52.5		12	50.0	+3 56.0	+0.0074	0.5542	+0.0224	+44-16
22 Aurigæ	6.4	2.08	10.9	28 51.6		13	51.4	+4 55.3	-1.0476	0.5545	0.0197	-22-61
β Tauri	1.8	2.09	10.7	28 32.4		15	7.7	+6 8.8	-0.6744	0.5549	0.0164	+5-57
107 B. Aurigæ	6.5	2.13	10.0	27 36.6		19	19.7	+10 11.9	+0.3865	0.5562	0.0055	+60+5
112 B. Aurigæ	5.7	2.12	9.8	26 52.5		19	52.1	+10 43.1	+1.1917	0.5563	+0.0040	+86+55
406 B. Tauri	5.6	+2.21	+9.3	+27 56.8	27	1	49.1	-7 32.6	+0.0001	0.5577	-0.0117	+44-15
136 Tauri	4.6	2.22	9.1	27 35.7		2	50.5	-6 33.4	+0.3681	0.5579	0.0144	+68+3
154 B. Aurigæ	6.4	2.26	9.2	28 55.9		4	12.7	-5 14.2	-1.1082	0.5581	0.0181	-28-61
415 B. Tauri	6.1	2.26	8.7	27 34.3		6	9.0	-3 22.1	+0.3320	0.5584	0.0232	+65+1
49 Aurigæ	5.1	2.42	6.8	28 5.5		20	49.5	+10 46.6	-0.8576	0.5594	0.0622	-7-62
54 Aurigæ	5.8	+2.44	+6.5	+28 20.5		22	41.4	-11 25.5	-1.2469	0.5594	-0.0671	-47-62
39 Geminorum	6.2	2.46	4.9	26 11.7	28	7	0.7	-3 24.3	+0.4182	0.5587	0.0889	+71-1
40 Geminorum	6.3	2.46	4.8	26 1.9		7	17.8	-3 7.8	+0.5682	0.5586	0.0896	+84+7
47 Geminorum	5.6	2.52	4.2	26 59.9		12	25.7	+1 49.0	-0.9634	0.5579	0.1027	-14-63
52 Geminorum	6.1	2.49	3.7	25 2.1		13	53.6	+3 13.9	+0.9906	0.5576	0.1064	+90+30
134 B. Geminorum	6.5	+2.54	+3.7	+26 50.7		14	53.0	+4 11.1	-1.0573	0.5574	-0.1089	-21-63
A Geminorum	5.1	2.52	3.1	25 12.9		17	42.0	+6 54.1	+0.3721	0.5568	0.1159	+67-6
176 B. Geminorum	6.3	2.54	2.0	24 33.1	29	0	8.5	-10 53.1	+0.2835	0.5552	0.1316	+61-12
181 B. Geminorum	6.0	2.54	1.9	24 25.0		0	33.9	-10 28.6	+0.3725	0.5551	0.1326	+67-8
κ Geimnorum	3.7	2.55	1.6	24 36.2		2	51.7	-8 15.7	-0.1378	0.5544	0.1381	+36-34
82 Geminorum	6.3	+2.53	+1.1	+23 21.2		4	41.1	-6 30.1	+0.9396	0.5538	-0.1423	+90+23
5 B. Cancri	6.4	2.56	+0.3	23 49.1		10	10.2	-1 12.6	-0.3716	0.5520	0.1549	+23-48
9 Cancri	6.2	2.55	-0.2	22 52.7		12	31.7	+1 4.0	+0.2543	0.5512	0.1602	+59-17
μ Cancri	5.5	2.52	0.4	21 49.7		13	11.4	+1 42.3	+1.2624	0.5510	0.1616	+83+48
35 B. Cancri	6.4	2.57	0.7	23 23.6		15	48.6	+4 14.0	-0.8295	0.5500	0.1674	-3-07
49 B. Cancri	6.0	+2.52	-1.3	+21 1.0		18	48.7	+7 7.9	+1.1785	0.5489	-0.1738	+90+37
η Cancri	5.5	2.52	2.2	20 43.8	80	0	22.6	-11 29.7	+0.4803	0.5467	0.1851	+74-8
39 Cancri	6.5	2.52	2.7	20 18.5		3	43.8	-8 15.5	+0.2935	0.5453	0.1917	+61-18
40 Cancri	6.5	2.52	2.7	20 16.3		3	46.1	-8 13.2	+0.3243	0.5453	0.1918	+63-16
102 B. Cancri	6.5	2.51	2.7	19 58.2		3	51.1	-8 8.4	+0.6260	0.5452	0.1920	+87-1
ε Cancri	6.3	+2.51	-2.7	+19 50.7		3	53.5	-8 6.1	+0.7592	0.5452	-0.1920	+90+6

## ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

JANUARY.

THE STAR'S					AT CONJUNCTION IN R. A.					Limiting Parallels.	
Name.	Mag.	Red'ns from 1915.0.		Apparent Declination.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	N.	S.
		$\Delta\alpha$	$\Delta\delta$		d h m	h m					
139 B. Cancr	6.1	+2.49	-3.5	+19 9.0	80 8 35.5	-3 33.7	+0.5591	0.5433	-0.2009	+81	-5
227 B. Cancr	6.4	2.41	5.5	15 43.9	22 43.5	+10 6.0	+1.1288	0.5375	0.2249	+90	+26
12 B. Leonis	6.3	2.43	5.8	16 57.1	81 0 43.1	-11 58.4	-0.5996	0.5367	0.2279	+12	-70
7 Leonis	6.2	2.38	6.4	14 45.5	5 35.8	-7 15.3	+0.5633	0.5348	0.2349	+80	-9
11 Leonis	6.5	2.38	6.6	14 43.8	6 36.4	-6 16.6	+0.3537	0.5344	0.2363	+64	-20
$\psi$ Leonis	5.6	+2.37	-6.9	+14 24.5	9 18.5	-3 39.8	+0.0450	0.5334	-0.2400	+46	-36
$\nu$ Leonis	5.0	2.32	7.7	12 50.9	16 13.2	+3 1.5	-0.0194	0.5310	0.2485	+43	-41
A Leonis	4.6	2.26	8.1	10 24.7	20 53.0	+7 32.3	+1.3389	0.5295	0.2537	+83	+43
$\alpha$ Leonis	1.3	+2.29	-8.3	+12 22.8	21 6.1	+7 45.0	-0.7593	0.5294	-0.2540	+4	-78

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44 Leonis	5.9	+2.20	-8.9	+9 12.9	1 5 15.6	-8 21.0	+0.4174	0.5272	-0.2618	+68	-20
45 Leonis	5.8	2.21	9.2	10 11.6	6 24.9	-7 13.9	-0.8983	0.5269	0.2628	-4	-80
$\rho$ Leonis	3.8	2.20	9.4	9 44.5	8 55.5	-4 48.1	-1.0922	0.5264	0.2648	-16	-80
48 Leonis	5.2	+2.16	-9.2	+7 23.3	9 54.6	-3 50.9	+1.0782	0.5261	-0.2656	+90	+16
49 Leonis	5.7	2.18	9.4	9 5.2	10 0.8	-3 44.9	-0.7040	0.5261	0.2656	+7	-80
37 Sextantis	6.3	2.12	9.8	6 49.1	15 24.6	+1 28.7	+0.1942	0.5251	0.2694	+54	-33
56 Leonis	6.1	2.09	10.1	6 38.2	20 15.8	+6 10.8	-0.9321	0.5244	0.2723	-6	-83
d Leonis	5.0	2.04	9.9	4 4.3	22 29.5	+8 20.3	+1.1012	0.5241	0.2734	+90	+17
75 Leonis	5.4	+1.97	-10.4	+2 28.5	2 6 41.3	-7 43.3	+0.4855	0.5235	-0.2766	+73	-19
76 Leonis	6.0	1.96	10.4	2 6.8	7 29.4	-6 56.8	+0.6347	0.5235	0.2768	+84	-11
79 Leonis	5.5	1.95	10.5	+1 52.3	9 59.9	-4 31.0	+0.1876	0.5235	0.2774	+54	-34
v Leonis	4.5	1.88	10.6	-0 21.4	16 19.3	+1 36.6	+0.7147	0.5237	0.2784	+90	-7
78 B. Virginis	6.5	1.71	10.6	5 15.0	8 10 28.2	-4 48.8	+0.6737	0.5267	0.2759	+84	-9
$\chi$ Virginis	4.8	+1.60	-10.7	-7 31.9	22 26.0	+6 46.0	-0.2694	0.5305	-0.2700	+29	-59
$\psi$ Virginis	5.0	1.52	10.6	9 4.8	4 5 33.6	-10 20.4	-0.5980	0.5335	0.2648	+11	-82
49 Virginis	5.2	1.46	10.5	10 17.3	11 52.4	-4 14.1	-1.0230	0.5365	0.2592	-14	-90
i Virginis	5.7	1.38	10.3	12 16.1	20 31.3	+4 7.6	-1.2134	0.5413	0.2499	-30	-90
75 Virginis	5.6	1.34	9.5	14 55.7	23 17.4	+6 48.0	+0.8005	0.5428	0.2465	+75	-1
83 Virginis	5.6	+1.30	-9.4	-15 45.3	5 4 30.6	+11 50.7	+0.3692	0.5462	-0.2395	+58	-25
85 Virginis	6.1	1.29	9.5	15 20.6	5 0.3	-11 40.8	-0.1655	0.5465	0.2388	+29	-53
43 H. Virginis	5.5	1.15	9.1	17 48.4	18 4.8	+0 56.2	-0.6579	0.5554	0.2180	+1	-90
231 G. Virginis	6.4	1.14	9.0	18 11.6	18 47.5	+1 37.3	-0.4212	0.5559	0.2168	+14	-69
236 G. Virginis	5.7	1.14	9.0	18 19.5	19 28.3	+2 16.6	-0.4345	0.5564	0.2155	+13	-71
9 G. Libræ	6.5	+1.06	-8.5	-20 4.2	6 2 21.9	+8 55.2	-0.1079	0.5614	-0.2025	+28	-50
17 G. Libræ	6.4	1.01	8.4	20 49.1	7 7.2	-10 30.0	-0.2885	0.5649	0.1927	+18	-61
18 G. Libræ	6.1	1.01	8.3	20 58.3	7 33.1	-10 5.1	-0.2169	0.5652	0.1918	+21	-57
43 B. Libræ	5.7	0.97	8.6	21 2.1	11 45.2	-6 2.4	-0.9381	0.5683	0.1826	-19	-90
47 G. Libræ	6.1	0.92	8.2	21 42.2	15 28.5	-2 27.6	-0.9249	0.5710	0.1741	-19	-90
64 G. Libræ	5.8	+0.87	-8.2	-22 5.3	19 30.7	+1 25.4	-1.2195	0.5738	-0.1644	-44	-89
153 B. Libræ	6.3	0.80	7.5	24 12.2	7 2 12.7	+7 51.9	-0.1219	0.5784	0.1475	+21	-51
42 Libræ	5.0	0.77	7.8	23 32.7	5 3.0	+10 35.4	-1.1976	0.5803	0.1401	-44	-90
b Scorp	4.7	0.72	7.1	25 29.7	9 14.2	-9 23.3	+0.2165	0.5830	0.1287	+37	-32
A Scorp	4.6	0.71	7.3	25 4.6	10 16.4	-8 23.5	-0.3408	0.5836	0.1258	+8	-65
31 B. Scorp	5.4	+0.71	-7.6	-24 17.0	10 23.8	-8 16.4	-1.1599	0.5836	-0.1254	-42	-90
3 Scorp	5.9	0.71	7.3	24 59.7	10 41.0	-7 59.9	-0.4748	0.5838	0.1247	+1	-75
4 Scorp	5.7	0.70	7.0	26 1.1	11 0.1	-7 41.6	+0.5231	0.5840	0.1237	+54	-15
40 B. Scorp	5.4	0.69	7.5	24 35.3	12 13.2	-6 31.4	-1.0740	0.5848	0.1203	-35	-90
$\pi$ Scorp	3.0	0.69	7.0	25 52.3	12 18.5	-6 26.3	+0.2159	0.5848	0.1201	+36	-32
48 B. Scorp	4.9	+0.67	-7.1	-25 37.9	14 3.7	-4 45.3	-0.2347	0.5858	-0.1151	+12	-58
65 B. Scorp	5.5	0.65	7.0	26 6.1	15 54.2	-2 59.3	+0.0348	0.5868	0.1098	+25	-42
85 B. Scorp	6.0	0.62	7.3	25 15.8	18 31.9	-0 27.9	-1.0925	0.5882	0.1021	-38	-90
$\delta$ Scorp	3.1	0.60	7.3	25 23.5	20 57.2	+1 51.5	-1.2015	0.5894	0.0949	-48	-87
$\alpha$ Scorp	1.2	0.56	7.0	26 14.8	8 0 5.3	+4 52.0	-0.6181	0.5908	0.0854	-10	-90
116 B. Scorp	6.2	+0.56	-7.0	-26 21.3	0 50.5	+5 35.3	-0.5710	0.5911	-0.0831	-8	-84

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
FEBRUARY.

THE STAR'S					AT CONJUNCTION IN R. A.					Limit- ing Pa- rallels.			
Name.		Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	N. S.		
			Δα	Δδ									
			s	"	°	d	h	m	h	m			
τ	Scorpii	2.9	+0.54	- 6.4	-28 2.5	8	2	31.9	+ 7 12.6	+1.0037	0.5918	-0.0779	+62+17
134 B.	Scorpii	6.4	0.50	6.8	27 18.0		5	44.5	+10 17.3	+0.0159	0.5930	0.0680	+21-43
135 B.	Scorpii	6.0	0.50	6.4	28 21.2		5	59.7	+10 31.9	+1.0685	0.5931	0.0672	+62+23
95 G.	Ophiuchi	6.1	0.40	6.6	27 39.6		16	21.7	- 3 31.8	-0.1623	0.5957	0.0343	+ 9-54
43	Ophiuchi	5.4	0.36	6.5	28 3.8		20	28.3	+ 0 24.6	+0.1341	0.5962	-0.0210	+23-36
163 G.	Ophiuchi	6.3	+0.29	- 6.6	-27 50.8	9	3	58.2	+ 7 35.8	-0.1530	0.5963	+0.0034	+ 7-53
X	Sagittarii (var.)	4.4	0.28	6.6	27 48.1		5	34.6	+ 9 8.1	-0.1889	0.5962	0.0086	+ 5-55
4 G.	Sagittarii	6.2	0.27	6.8	26 56.9		5	55.8	+ 9 28.4	-1.0538	0.5962	0.0097	-43-90
10 G.	Sagittarii	5.7	0.25	6.5	28 3.2		9	0.8	-11 34.2	+0.1169	0.5958	0.0197	+22-37
210 B.	Scorpii	5.8	0.24	6.4	28 45.1		9	44.5	-10 52.4	+0.8426	0.5957	0.0220	+61+ 6
38 B.	Sagittarii	4.7	+0.21	- 6.4	-28 28.1		13	18.5	- 7 27.2	+0.6540	0.5950	+0.0335	+50- 6
	C. D.-28° 14268	6.4	0.20	6.3	28 55.3		14	46.3	- 6 3.1	+1.1682	0.5946	0.0382	+61+34
48 G.	Sagittarii	6.3	0.18	6.5	28 19.1		16	50.2	- 4 4.2	+0.6390	0.5941	0.0447	+50- 7
62 B.	Sagittarii	6.0	0.18	6.3	28 41.0		16	50.3	- 4 4.1	+1.0107	0.5941	0.0447	+61+28
66 B.	Sagittarii	4.7	0.18	6.8	27 4.6		17	6.6	- 3 48.5	-0.6145	0.5940	0.0456	-14-90
58 G.	Sagittarii	6.1	+0.17	- 6.4	-28 28.3		18	35.4	- 2 23.3	+0.8783	0.5935	+0.0503	+62+ 8
68 G.	Sagittarii	6.2	0.15	6.8	26 41.3		20	48.0	- 0 16.2	-0.8207	0.5927	0.0572	-24-90
69 G.	Sagittarii	6.3	0.15	6.8	26 48.6		20	56.5	- 0 8.1	-0.6873	0.5927	0.0577	-17-90
86 B.	Sagittarii	6.5	0.15	6.8	26 38.3		21	16.1	+ 0 10.7	-0.8439	0.5926	0.0587	-15-90
φ	Sagittarii	3.3	0.10	6.6	27 4.9	10	3	40.1	+ 6 19.2	+0.0458	0.5898	0.0784	+23-44
σ	Sagittarii	2.1	+0.08	- 6.8	-26 24.3		7	23.9	+ 9 53.9	-0.3311	0.5879	+0.0895	+ 5-45
201 B.	Sagittarii	5.9	0.04	6.8	26 3.1		14	25.9	- 7 20.9	+0.0094	0.5838	0.1099	+24- 8
ψ	Sagittarii	4.9	0.03	6.9	25 24.4		15	21.2	- 6 27.8	-0.5496	0.5833	0.1125	- 4-42
χ	Sagittarii	4.9	+0.01	7.0	24 40.6		19	13.6	- 2 44.5	-0.8410	0.5807	0.1232	-19-90
51	Sagittarii	5.8	0.00	6.8	24 54.5		23	32.1	+ 1 23.9	-0.0486	0.5776	0.1347	+24-40
h	Sagittarii	4.7	-0.01	- 6.8	-25 4.4		23	48.2	+ 1 39.4	+0.1582	0.5774	+0.1354	+34-35
53	Sagittarii	6.3	0.02	7.0	23 37.4	11	1	5.2	+ 2 53.4	-1.1536	0.5765	0.1387	-40-90
274 B.	Sagittarii	6.1	0.02	7.0	23 37.6		1	12.4	+ 3 0.3	-1.1348	0.5764	0.1390	-38-90
308 B.	Sagittarii	6.3	0.04	6.8	24 9.3		6	59.4	+ 8 34.0	+0.2539	0.5719	0.1535	+41-90
329 B.	Sagittarii	6.1	0.05	6.9	22 58.4		9	56.1	+11 24.1	-0.4989	0.5696	0.1605	+ 3-76
336 B.	Sagittarii	6.5	-0.06	- 6.9	-22 50.2		10	54.7	-11 39.5	-0.4822	0.5688	+0.1628	+ 5-75
NEW MOON.													
13	Piscium	6.4	-0.09	- 1.5	- 1 33.3	15	14	42.1	-11 4.6	+0.5914	0.5014	+0.2665	+80-14
14	Piscium	5.9	0.09	1.5	- 1 43.0		15	52.1	- 9 56.6	+1.0761	0.5011	0.2663	+88+14
λ	Piscium	4.6	-0.10	- 0.8	+ 1 18.7		20	7.2	- 5 48.7	-1.0449	0.5000	+0.2658	-13-90
21	Piscium	5.6	0.07	0.5	0 36.2	16	0	6.1	- 1 56.6	+0.7734	0.4991	0.2650	+90- 4
22	Piscium	5.8	0.08	0.1	2 27.5		1	27.2	- 0 37.8	-0.8649	0.4988	0.2647	- 1-88
25	Piscium	6.2	-0.07	- 0.2	1 37.1		2	3.2	- 0 2.8	+0.1988	0.4987	0.2646	+55-31
51	Piscium	5.6	+0.02	+ 2.3	6 29.2		23	21.2	- 3 20.6	+0.4821	0.4968	0.2553	+72-18
136 B.	Piscium	6.5	+0.03	+ 3.2	+ 8 53.5	17	4	7.5	+ 1 17.8	-0.9237	0.4970	+0.2522	- 5-82
7	Piscium	3.7	0.20	6.5	14 54.6	18	7	5.3	+ 3 29.9	-1.0079	0.5015	0.2286	-12-75
101	Piscium	6.2	0.23	6.5	14 13.7		9	22.0	+ 5 42.6	+0.2579	0.5022	0.2261	+58-60
105	Piscium	6.1	0.24	7.1	15 58.6		11	24.7	+ 7 41.8	-1.2040	0.5028	0.2238	-27-74
4	Arietis	5.8	0.28	7.6	16 32.1		15	52.7	-11 58.0	-0.8311	0.5042	0.2185	0-73
1	Arietis	5.1	+0.32	+ 8.1	+17 24.3		20	39.7	- 7 19.3	-0.7595	0.5059	+0.2126	+ 3-73
35 B.	Arietis	6.4	0.35	8.4	17 50.9		23	57.6	- 4 7.3	-0.5532	0.5072	0.2083	+14-86
47 B.	Arietis	6.5	0.38	8.4	17 37.6	19	2	3.6	- 2 4.9	+0.1238	0.5080	0.2055	+51-90
20 H <sup>1</sup> .	Arietis	6.4	0.39	8.2	16 49.7		2	53.7	- 1 16.2	+1.1767	0.5083	0.2043	+90+31
15	Arietis	5.9	0.38	9.0	19 6.1		3	30.8	- 0 40.2	-1.2063	0.5086	0.2035	-29-71
θ	Arietis	5.6	+0.43	+ 9.2	+19 30.7		7	21.8	+ 3 3.9	-0.8856	0.5102	+0.1981	- 5-70
26	Arietis	6.2	0.50	9.5	19 28.9		13	43.3	+ 9 14.0	+0.3767	0.5130	0.1886	+66-15
ν	Arietis	5.4	0.54	10.4	21 35.8		17	49.2	-10 47.6	-1.2029	0.5149	0.1822	-31-68
μ	Arietis	5.7	0.58	9.8	19 39.2		19	37.1	- 9 3.0	+1.2729	0.5158	0.1793	+85+66
8	Arietis (mean)	4.6	0.68	10.5	21 0.2	20	3	57.6	- 0 57.9	+1.2166	0.5198	0.1653	+90+14
64	Arietis	5.8	+0.84	+11.8	+24 25.6		16	6.6	+10 48.1	-0.6974	0.5260	+0.1430	+ 5-65

MENTS FOR THE PREDICTION OF OCCULTATIONS.  
FEBRUARY.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
FEBRUARY.

THE STAR'S	AT CONJUNCTION IN R. A.	Limit- ing Pa- rallels.
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MARCH.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

MARCH.

THE STAR'S					AT CONJUNCTION IN R. A.					Limiting Parallels.		
	Mag.	Red'ns from 1915.0.		Apparent Declination.	Washington Mean Time.	Hour Angle, H		Y	x'	y'	N.	S.
		Δα	Δδ									
		s	"	° '	d h m	h m					°	°
ii	5.8	+1.17	- 6.4	-28 45.1	8 15 16.5	- 3 33.0	+0.8762	0.5914	+0.0219		+61	+ 8
arii	4.7	1.13	6.2	28 28.1	18 53.1	- 0 5.2	+0.6871	0.5903	0.0332		+59	- 4
-28° 14268	6.4	1.11	6.0	28 55.3	20 22.1	+ 1 20.1	+1.2039	0.5898	0.0379		+61	+39
arii	6.3	1.09	6.1	28 19.1	22 27.7	+ 3 20.7	+0.6724	0.5890	0.0443		+58	- 5
arii	6.0	1.09	5.9	28 41.0	22 27.9	+ 3 20.9	+1.0459	0.5890	0.0443		+61	+21
arii	4.7	+1.07	- 6.5	-27 4.6	22 44.4	+ 3 36.6	-0.5877	0.5889	+0.0452		-12	-86
arii	6.1	1.07	5.9	28 28.3	9 0 14.4	+ 5 3.1	+0.9130	0.5883	0.0498		+62	+11
arii	6.2	1.03	6.4	26 41.3	2 29.1	+ 7 12.3	-0.7954	0.5874	0.0567		-23	-90
arii	6.3	1.03	6.3	26 48.6	2 37.7	+ 7 20.5	-0.6613	0.5873	0.0571		-16	-90
arii	6.5	1.02	6.4	26 38.3	2 57.5	+ 7 39.5	-0.8188	0.5871	0.0581		-24	-90
arii	3.3	+0.96	- 5.8	-27 4.8	9 27.8	-10 5.8	+0.0756	0.5839	+0.0775		+25	-39
arii	2.1	0.91	5.7	26 24.3	13 15.6	- 6 27.0	-0.3042	0.5817	0.0885		+ 6	-63
arii	5.9	0.84	5.4	26 3.1	20 25.5	+ 0 26.1	+0.0380	0.5772	0.1085		+26	-42
arii	4.9	0.82	5.5	25 24.3	21 21.8	+ 1 20.2	-0.5254	0.5766	0.1110		- 3	-80
arii	4.9	0.78	5.5	24 40.6	10 1 18.8	+ 5 8.1	-0.8198	0.5738	0.1216		-18	-90
arii	5.8	+0.74	- 5.1	-24 54.4	5 42.7	+ 9 21.9	-0.0218	0.5706	+0.1328		+25	-45
arii	4.7	0.74	5.1	25 4.4	5 59.2	+ 9 37.9	+0.1867	0.5704	0.1335		+36	-33
arii	6.3	0.71	5.4	23 37.4	7 17.8	+10 53.5	-1.1366	0.5694	0.1368		-38	-90
arii	6.1	0.71	5.4	23 37.6	7 25.1	+11 0.5	-1.1175	0.5693	0.1371		-36	-90
arii	6.3	0.66	4.9	24 9.3	13 19.6	- 7 18.2	+0.2820	0.5648	0.1513		+43	-28
arii	6.1	+0.62	- 5.0	-22 58.4	16 20.1	- 4 24.4	-0.4781	0.5624	+0.1583		+ 5	-75
arii	6.5	0.61	5.0	22 50.2	17 20.0	- 3 26.7	-0.4616	0.5616	0.1605		+ 6	-73
corni	5.7	0.56	4.8	22 4.5	23 28.3	+ 2 28.4	-0.2273	0.5567	0.1738		+19	-57
corni	6.2	0.52	4.3	22 40.5	11 4 28.9	+ 7 18.2	+1.2956	0.5526	0.1839		+67	+44
corni	5.7	0.40	4.7	18 14.8	15 50.9	- 5 43.4	-1.1181	0.5435	0.2045		-29	-90
corni	6.2	+0.40	- 4.3	-19 22.0	18 1.5	- 3 37.2	+0.5028	0.5418	+0.2081		+62	-17
corni	6.5	0.38	4.6	17 51.8	18 37.4	- 3 2.5	-0.9461	0.5413	0.2090		-16	-90
corni	4.2	0.37	4.5	17 34.4	20 57.8	- 0 46.9	-0.7590	0.5395	0.2127		- 4	-90
US	6.0	...	...	17 18.1	23 7.0	+ 1 18.0	-0.5828	0.5358	0.2154		+ 6	-82
corni	6.1	0.34	4.2	17 41.9	12 1 13.5	+ 3 20.3	+0.2929	0.5362	0.2190		+52	-28
corni	5.4	+0.34	- 3.9	-18 20.6	2 33.1	+ 4 37.3	+1.2622	0.5352	+0.2209		+72	+35
corni	6.3	0.34	4.0	17 49.2	2 42.0	+ 4 45.9	+0.7463	0.5351	0.2211		+72	- 3
corni	4.3	0.32	4.1	17 11.9	4 35.1	+ 6 35.4	+0.5123	0.5336	0.2237		+65	-17
corni	5.1	0.24	4.0	14 25.7	13 51.5	- 8 26.1	-0.2736	0.5270	0.2353		+25	-59
corni	6.0	0.24	3.9	14 47.4	14 35.4	- 7 43.6	+0.2802	0.5265	0.2361		+54	-29
corni	5.8	+0.25	- 3.8	-15 8.4	15 2.7	- 7 17.2	+0.7579	0.5262	+0.2366		+75	- 4
corni	6.1	0.22	3.9	13 7.2	17 49.8	- 4 35.4	-0.7112	0.5244	0.2396		+ 2	-90
corni	5.2	0.22	- 3.7	13 57.2	19 34.8	- 2 53.7	+0.5897	0.5232	0.2414		+73	-13
URY	0.7	...	...	-12 53.8	20 35.9	- 1 54.4	-0.2820	0.4962	0.2427		+26	-60
NEW MOON.												
1m	3.7	0.00	+ 4.7	+14 54.6	17 15 6.0	-10 41.6	-1.0811	0.5042	+0.2291		-17	-75
1m	6.2	+0.02	4.8	14 13.7	17 22.1	- 8 29.4	+0.1837	0.5049	0.2266		+54	-30
1m	6.1	0.02	5.2	15 58.6	19 24.2	- 6 30.9	-1.2798	0.5055	0.2243		-35	-74
is	5.8	0.04	5.6	16 32.1	23 50.9	- 2 12.0	-0.9095	0.5070	0.2191		- 6	-73
is	5.1	+0.06	+ 6.1	+17 24.3	18 4 36.5	+ 2 25.3	-0.8409	0.5087	+0.2131		- 2	-73
is	6.4	0.08	6.4	17 50.8	7 53.5	+ 5 36.5	-0.6365	0.5099	0.2088		+10	-71
is	6.5	0.10	6.4	17 37.6	9 58.8	+ 7 38.0	+0.0394	0.5107	0.2059		+46	-34
is	6.4	0.11	6.3	16 49.7	10 48.7	+ 8 26.5	+1.0920	0.5110	0.2048		+90	+24
is	5.9	0.10	6.8	19 6.1	11 25.7	+ 9 2.4	-1.2919	0.5112	0.2039		-39	-71
is	5.6	+0.13	+ 7.2	+19 30.6	15 15.5	-11 14.7	-0.9733	0.5128	+0.1985		-11	-70
is	6.2	0.18	7.6	19 28.8	21 35.5	- 5 6.2	+0.2860	0.5154	0.1889		+60	-19
is	5.4	0.20	8.4	21 35.8	19 1 40.5	- 1 8.6	-1.2965	0.5172	0.1825		-43	-68
is	5.7	0.24	8.0	19 39.1	3 28.1	+ 0 35.7	+1.1798	0.5180	0.1795		+90	+36
is (mean)	4.6	0.31	8.7	21 0.2	11 47.3	+ 8 39.4	+1.1200	0.5217	0.1653		+90	+32
is	5.8	+0.43	+10.1	+24 25.6	23 55.5	- 3 35.3	-0.8012	0.5272	+0.1428		- 2	-66



ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
MARCH.

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## ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

### MARCH.

### APRIL.

H. Virginis	5.5	+2.53	-17.3	-17 48.6	1	8 25.6	-5 7.9	-0.5240	0.5727	-0.2233	+ 8-77
G. Virginis	6.4	2 53	17.2	18 11.7		9 6.0	-4 20.0	-0.2922	0.5732	0.2230	+20-61
G. Virginis	5.7	2.53	17.2	18 19.6		9 44.6	-3 51.9	-0.3043	0.5737	0.2207	+19-61
G. Libræ	6.5	2.53	16.6	20 4.3		16 16.4	+2 24.9	+0.0226	0.5783	0.2071	+34-42
G. Libræ	6.4	2.53	16.2	20 49.2		20 47.2	+6 45.1	-0.1483	0.5813	0.1969	+25-52
G. Libræ	6.1	+2.53	-16.2	-20 58.4		21 11.9	+7 8.9	-0.0779	0.5816	-0.1960	+28-48
B. Libræ	5.7	2.54	16.4	21 2.3	2	1 11.5	+10 59.0	-0.7781	0.5843	0.1864	-10-90
G. Libræ	6.1	2 51	15.5	21 42.4		4 44.0	-9 37.0	-0.7617	0.5866	0.1776	-10-90
G. Libræ	5.8	2.50	15.2	22 5.4		8 35.0	-5 55.3	-1.0464	0.5889	0.1675	-29-90
B. Libræ	6.3	2.49	14.2	24 12.3		14 59.3	+0 13.4	+0.0337	0.5925	0.1500	+29-42
Libræ	5.0	+2.47	-14.1	-23 32.8		17 42.5	+2 49.9	-1.0181	0.5939	-0.1422	-29-90
Scorpii	4.7	2.47	13.2	25 29.8		21 43.8	+6 41.3	+0.3718	0.5957	0.1305	+45-23
Scorpii	4.6	2.46	13.2	25 4.7		22 43.6	+7 38.6	-0.1742	0.5962	0.1275	+16-54
B. Scorpii	5.4	2.45	13.4	24 17.1		22 50.6	+7 45.3	-0.9780	0.5962	0.1271	-28-90
Scorpii	5.9	2.46	13.2	24 59.8		23 7.3	+8 1.3	-0.3054	0.5963	0.1263	+10-62
Scorpii	5.7	+2.47	-12.9	-26 1.2		23 25.6	+8 18.8	+0.6743	0.5964	-0.1254	+62-6
B. Scorpii	5.4	2.45	13.1	24 35.4	3	0 36.0	+9 26.4	-0.8927	0.5970	0.1218	-23-90
Scorpii	3.0	2.46	12.8	25 52.4		0 41.1	+9 31.3	+0.3738	0.5970	0.1216	+45-23
B. Scorpii	4.9	2.45	12.7	25 38.0		2 22.5	+11 8.5	-0.0672	0.5977	0.1165	+21-47
B. Scorpii	6.4	2.43	13.0	24 29.8		2 36.0	+11 21.4	-1.2248	0.5977	0.1158	-50-84
B. Scorpii	5.5	+2.44	-12.3	-26 6.2		4 9.1	-11 9.4	+0.1989	0.5982	-0.1110	+34-33
B. Scorpii	6.0	2.42	12.3	25 15.9		6 41.4	-8 43.5	-0.9077	0.5991	0.1031	-25-90
Scorpii	3.1	2.40	12.0	25 23.6		9 2.0	-6 28.8	-1.0138	0.5997	0.0957	-33-90
Scorpii	1.2	2.39	11.4	26 14.8		12 4.4	-3 34.0	-0.4381	0.6004	0.0860	-1-72
B. Scorpii	6.2	2.39	11.3	26 21.4		12 48.3	-2 52.0	-0.3913	0.6006	0.0837	+1-69
Scorpii	2.9	+2.40	-10.6	-28 2.6		14 26.8	-1 17.6	+1.1613	0.6009	-0.0784	+62+33
B. Scorpii	6.4	2.36	10.5	27 18.0		17 34.1	+1 41.7	+0.1900	0.6013	0.0683	+30-33
B. Scorpii	6.0	2.38	10.1	28 21.3		17 49.0	+1 56.0	+1.2284	0.6013	0.0674	+62+42
B. Ophiuchi	6.2	2.28	9.7	26 24.1	4	1 55.7	+9 42.0	-1.1681	0.6016	0.0408	-50-90
G. Ophiuchi	6.1	2.28	9.0	27 39.6		3 57.3	+11 38.5	+0.0196	0.6014	0.0341	+18-43
Oph. (1st star)	5.4	+2.24	-9.6	-26 28.9		5 4.4	-11 17.3	-1.2009	0.6013	-0.0304	-54-85

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ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
APRIL.

**LEMENTS FOR THE PREDICTION OF OCCULTATIONS.**

**APRIL.**

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ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
APRIL.

MAY.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

MAY.

THE STAR'S					AT CONJUNCTION IN R. A.					Limiting Parallels.	
Name.	Mag.	Red'ns from 1915.0.		Apparent Declination.	Washington Mean Time.	Hour Angle, <i>H</i>	<i>Y</i>	<i>x'</i>	<i>y'</i>	<i>N.</i>	<i>S.</i>
		<i>Δα</i>	<i>Δδ</i>								
		<i>s</i>	<i>"</i>	<i>°</i> <i>'</i>	<i>d</i> <i>h</i> <i>m</i>	<i>h</i> <i>m</i>				<i>°</i>	<i>°</i>
G. Ophiuchi	6.3	+3.03	-7.8	-27 50.8	1 23 33.1	+ 8 33.2	+0.2299	0.6104	+0.0051	+27	-30
Sagittarii ( <i>var.</i> )	4.4	3.02	7.5	27 48.1	2 1 5.4	+10 1.5	+0.1975	0.6099	0.0103	+25	-32
G. Sagittarii	6.2	2.99	7.7	26 56.9	1 25.7	+10 20.8	-0.6469	0.6098	0.0115	-18	-90
G. Sagittarii	5.7	3.00	6.8	28 3.2	4 23.3	-10 49.3	+0.5020	0.6085	0.0216	+44	-15
B. Scorpii	5.8	3.01	6.4	28 45.1	5 5.3	-10 9.1	+1.2130	0.6082	0.0239	+61	+41
B. Sagittarii	4.7	+2.97	-5.8	-28 28.1	8 31.3	- 6 51.9	+1.0348	0.6064	+0.0355	+62	+21
G. Sagittarii	6.3	2.94	5.3	28 19.1	11 55.7	- 3 36.3	+1.0261	0.6045	0.0466	+62	+20
B. Sagittarii	4.7	2.91	5.5	27 4.5	12 11.6	- 3 21.1	-0.2025	0.6043	0.0476	+ 8	-56
G. Sagittarii	6.1	2.93	4.8	28 28.2	13 37.6	- 1 58.8	+1.2637	0.6034	0.0522	+62	+52
G. Sagittarii	6.2	2.86	4.9	26 41.2	15 46.1	+ 0 4.3	-0.4005	0.6020	0.0592	- 1	-69
G. Sagittarii	6.3	+2.87	-4.8	-26 48.6	15 54.4	+ 0 12.3	-0.2694	0.6019	+0.0596	+ 5	-60
B. Sagittarii	6.5	2.86	4.8	26 38.3	16 13.3	+ 0 30.4	-0.4228	0.6017	0.0606	- 2	-71
Sagittarii	3.3	2.81	3.5	27 4.8	22 27.0	+ 6 28.4	+0.4588	0.5971	0.0800	+46	-18
Sagittarii	2.1	2.75	3.0	26 24.3	8 2 5.7	+ 9 58.1	+0.0917	0.5941	0.0910	+27	-38
B. Sagittarii	6.4	2.70	3.2	24 59.5	3 17.3	+11 6.7	-1.2202	0.5931	0.0946	-51	-85
G. Sagittarii	6.4	+2.70	-3.0	-25 3.7	4 4.6	+11 52.2	-1.0747	0.5924	+0.0969	-37	-90
B. Sagittarii	5.8	2.68	2.9	24 57.9	4 51.8	-11 22.6	-1.0949	0.5918	0.0992	-39	-90
B. Sagittarii	6.1	2.66	2.6	24 47.5	7 5.2	- 9 14.6	-1.0444	0.5897	0.1056	-34	-90
B. Sagittarii	5.9	2.66	1.8	26 3.0	8 59.8	- 7 24.6	+0.4340	0.5880	0.1110	+47	-19
Sagittarii	4.9	2.64	1.9	25 24.3	9 54.2	- 6 32.5	-0.1174	0.5871	0.1135	+18	-50
B. Sagittarii	6.1	+2.62	-2.2	-24 19.5	9 55.3	- 6 31.4	-1.2067	0.5871	+0.1135	-48	-88
Sagittarii	4.9	2.58	1.4	24 40.5	13 43.4	- 2 52.3	-0.4034	0.5835	0.1238	+ 5	-69
Sagittarii	5.5	2.56	1.6	24 7.8	13 49.2	- 2 46.8	-0.9436	0.5834	0.1241	-26	-90
Sagittarii	5.8	2.53	0.6	24 54.4	17 59.2	+ 1 13.4	+0.3831	0.5794	0.1350	+47	-22
Sagittarii	4.7	2.53	0.5	25 4.3	18 15.2	+ 1 28.7	+0.5882	0.5791	0.1356	+59	-11
Sagittarii	6.3	+2.48	-0.7	-23 37.3	19 31.6	+ 2 42.1	-0.7116	0.5778	+0.1388	-10	-90
B. Sagittarii	6.1	2.48	-0.7	23 37.5	19 38.6	+ 2 48.8	-0.6926	0.5777	0.1391	- 9	-90
B. Sagittarii	6.3	2.42	+0.3	24 9.2	4 1 23.8	+ 8 20.8	+0.6868	0.5718	0.1530	+65	- 5
B. Sagittarii	6.1	2.36	0.5	22 58.3	4 20.1	+11 10.4	-0.0607	0.5688	0.1597	+26	-47
B. Sagittarii	6.5	2.34	0.7	22 50.1	5 18.6	-11 53.2	-0.0441	0.5678	0.1619	+27	-46
Capricorni	5.7	+2.26	+1.3	-22 4.4	11 19.4	- 6 5.8	+0.1880	0.5615	+0.1747	+40	-33
B. Capricorni	6.4	2.01	2.0	18 21.0	5 1 1.5	+ 7 7.0	-1.0844	0.5475	0.2000	-27	-90
Capricorni	5.7	1.98	2.3	18 14.7	3 28.7	+ 9 29.2	-0.6984	0.5451	0.2039	- 1	-90
Capricorni	6.2	1.98	3.0	19 21.9	5 38.2	+11 34.2	+0.9081	0.5430	0.2073	+71	+ 7
Capricorni	6.5	1.94	2.5	17 51.7	6 13.8	-11 51.4	-0.5300	0.5424	0.2082	+ 8	-77
Capricorni	4.2	+1.91	+2.7	-17 34.2	8 33.2	- 9 36.7	-0.3461	0.5402	+0.2117	+18	-64
B. Capricorni	6.1	1.86	3.3	17 41.8	12 47.7	- 5 30.7	+0.6955	0.5362	0.2175	+72	- 6
URANUS	6.0	...	...	16 48.5	14 0.1	- 4 20.6	+0.0329	0.5346	0.2190	+38	-42
Capricorni	6.3	1.85	3.5	17 49.1	14 15.9	- 4 5.4	+1.1451	0.5348	0.2195	+72	+24
Capricorni	4.3	1.81	3.5	17 11.8	16 8.7	- 2 16.2	+0.9109	0.5331	0.2219	+73	+ 7
Capricorni	5.1	+1.66	+3.5	-14 25.6	6 1 25.1	+ 6 42.2	+0.1179	0.5252	+0.2325	+45	-37
Capricorni	6.0	1.66	3.8	14 47.3	2 9.1	+ 7 24.9	+0.6690	0.5246	0.2333	+75	- 8
Capricorni	5.8	1.66	4.0	15 8.3	2 36.5	+ 7 51.4	+1.1448	0.5242	0.2337	+75	+22
B. Capricorni	6.1	1.60	3.6	13 7.1	5 24.1	+10 33.8	-0.3247	0.5220	0.2365	+23	-62
Capricorni	5.2	1.60	4.0	13 57.1	7 9.5	-11 44.1	+0.9709	0.5207	0.2381	+76	+10
Aquarii	5.4	+1.47	+4.2	-11 58.9	15 51.6	- 3 18.0	+0.9968	0.5145	+0.2452	+78	+11
B. Aquarii	6.0	1.41	3.7	9 27.8	19 3.7	- 0 11.7	-0.8872	0.5124	0.2474	- 5	-90
G. Aquarii	6.3	1.28	4.3	8 20.3	7 6 10.5	+10 35.4	+0.6997	0.5060	0.2535	+82	- 7
Aquarii	6.4	1.25	4.2	7 24.4	8 44.4	-10 55.2	+0.3570	0.5048	0.2546	+63	-25
B. Aquarii	5.8	1.17	4.1	5 26.4	15 4.2	- 4 46.3	-0.1310	0.5019	0.2568	+36	-50
G. Aquarii	6.3	+1.15	+4.2	- 5 15.8	16 11.7	- 3 40.7	-0.0312	0.5015	+0.2571	+41	-45
B. Aquarii	6.1	1.13	4.3	5 10.0	18 27.6	- 1 28.7	+0.4490	0.5006	0.2576	+69	-20
B. Aquarii	5.5	1.05	4.6	3 57.5	8 2 1.3	+ 5 52.2	+1.1042	0.4980	0.2589	+86	+17
Piscium	6.4	0.96	4.5	1 33.2	10 55.9	- 9 28.1	+0.8197	0.4959	0.2592	+88	- 1
Piscium	5.9	0.95	4.6	- 1 42.9	12 7.4	- 8 18.6	+1.3040	0.4957	0.2592	+88	+35
Piscium	4.6	+0.88	+4.0	+ 1 18.8	16 27.6	- 4 5.6	-0.8553	0.4949	+0.2588	- 2	-89

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
MAY.

THE STAR'S					AT CONJUNCTION IN R. A.					Limit- ing Par- allels.
Name.	Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	
		Δα	Δδ		d h m	h m				N. S.
21 Piscium	5.6	+0.86	+ 4.6	0 36.3	8 20 31.0	- 0 8.9	+0.9620	0.4945	+0.2582	+90+ 7
22 Piscium	5.8	0.84	4.1	2 27.5	21 53.6	+ 1 11.4	-0.6973	0.4944	0.2579	+ 7-88
25 Piscium	6.2	0.84	4.4	1 37.2	22 30.3	+ 1 47.1	+0.3734	0.4944	0.2578	+65-24
51 Piscium	5.6	0.66	4.7	6 29.3	9 20 7.0	- 1 12.0	+0.5579	0.4950	0.2496	+78-14
136 B. Piscium	6.5	0.61	4.4	8 53.6	10 0 56.4	+ 3 29.5	-0.8816	0.4958	0.2468	- 3-81
7 Piscium	3.7	+0.44	+ 5.1	+14 54.6	4 3.3	+ 5 50.7	-1.0964	0.5034	+0.2245	-19-75
101 Piscium	6.2	0.44	5.3	14 13.7	6 20.2	+ 8 3.6	+0.1653	0.5043	0.2222	+53-30
105 Piscium	6.1	0.42	5.2	15 58.6	8 23.1	+10 3.0	-1.3140	0.5051	0.2199	-41-74
NEW MOON.										
38 B. Aurigæ	6.5	+0.59	+ 8.4	+27 34.8	15 11 25.2	+ 9 57.2	-0.3454	0.5468	+0.0371	+24-37
47 B. Aurigæ	6.0	0.61	8.4	27 55.6	13 43.1	-11 49.6	-0.6509	0.5472	0.0315	+ 6-57
354 B. Tauri	6.4	0.65	8.4	27 52.5	18 46.7	- 6 56.5	-0.4648	0.5479	0.0191	+17-43
β Tauri	1.8	0.68	8.4	28 32.3	21 8.7	- 4 39.3	-1.1640	0.5482	0.0133	-35-61
107 B. Aurigæ	6.5	0.71	8.2	27 36.6	16 1 29.1	- 0 28.0	-0.0984	0.5484	0.0026	+38-20
112 B. Aurigæ	5.7	+0.71	+ 8.1	+26 52.5	2 2.7	+ 0 4.5	+0.7186	0.5485	+0.0012	+90+23
406 B. Tauri	5.6	0.77	8.2	27 56.7	8 13.0	+ 6 2.0	-0.5094	0.5486	-0.0141	+14-45
136 Tauri	4.6	0.78	8.0	27 35.7	9 16.9	+ 7 3.7	-0.1375	0.5486	0.0167	+35-23
415 B. Tauri	6.1	0.82	8.0	27 34.3	12 43.4	+10 23.1	-0.1828	0.5484	0.0253	+33-26
37 Geminorum	5.7	1.06	6.3	25 29.1	17 13 13.4	+10 2.8	+0.7689	0.5445	0.0843	+90+18
39 Geminorum	6.2	+1.08	+ 6.4	+26 11.7	14 47.9	+11 34.0	-0.1494	0.5440	-0.0880	+35-30
40 Geminorum	6.3	1.09	6.3	26 1.9	15 6.1	+11 51.7	+0.0035	0.5439	0.0887	+44-22
52 Geminorum	6.1	1.16	5.6	25 2.1	22 4.3	- 5 24.3	+0.4249	0.5419	0.1046	+71- 2
A Geminorum	5.1	1.20	5.4	25 13.0	18 2 6.2	- 1 30.6	-0.2140	0.5406	0.1136	+31-36
176 B. Geminorum	6.3	1.27	4.6	24 33.2	8 56.1	+ 5 5.7	-0.3133	0.5383	0.1284	+26-43
181 B. Geminorum	6.0	+1.28	+ 4.6	+24 25.0	9 23.0	+ 5 31.6	-0.2227	0.5382	-0.1294	+31-38
187 B. Geminorum	6.3	1.27	4.2	23 13.0	10 13.7	+ 6 20.7	+0.9795	0.5379	0.1312	+90+26
κ Geminorum	3.7	1.30	4.4	24 36.2	11 49.3	+ 7 53.1	-0.7483	0.5373	0.1345	+ 1-65
82 Geminorum	6.3	1.31	3.9	23 21.2	13 45.5	+ 9 45.5	+0.3541	0.5366	0.1385	+65-10
5 B. Cancri	6.4	1.38	3.5	23 49.1	19 35.4	- 8 36.2	-0.9950	0.5345	0.1503	-15-66
9 Cancri	6.2	+1.40	+ 3.0	+22 52.8	22 5.8	- 6 10.7	-0.3547	0.5335	-0.1552	+24-48
μ Cancri	5.5	1.40	2.6	21 49.8	22 48.1	- 5 29.8	+0.6785	0.5333	0.1566	+90+ 5
49 B. Cancri	6.0	1.45	1.8	21 1.0	19 4 47.0	+ 0 17.5	+0.5897	0.5310	0.1680	+84- 1
7 Cancri	5.5	1.51	1.2	20 43.9	10 42.2	+ 6 1.3	-0.1270	0.5288	0.1787	+37-39
39 Cancri	6.5	1.55	0.8	20 18.5	14 16.2	+ 9 28.4	-0.3182	0.5275	0.1849	+26-50
40 Cancri	6.5	+1.55	+ 0.7	+20 16.3	14 18.7	+ 9 30.9	-0.2866	0.5275	-0.1850	+28-48
102 B. Cancri	6.5	1.54	0.6	19 58.3	14 24.0	+ 9 36.0	+0.0226	0.5274	0.1851	+45-32
ε Cancri	6.3	1.54	+ 0.6	19 50.8	14 26.6	+ 9 38.5	+0.1499	0.5274	0.1852	+52-25
δ Cancri	4.2	1.55	- 0.2	18 28.0	16 30.4	+11 38.3	+1.2538	0.5267	0.1887	+88+42
139 B. Cancri	6.1	1.59	0.1	19 9.0	19 26.3	- 9 31.3	-0.0445	0.5257	0.1935	+41-36
X Cancri (var.)	6.2	+1.59	- 0.9	+17 33.3	21 42.6	- 7 19.3	+1.2303	0.5249	-0.1972	+90+38
227 B. Cancri	6.4	1.70	2.8	15 43.9	20 10 25.7	+ 4 59.9	+0.5504	0.5210	0.2163	+79- 9
12 B. Leonis	6.3	1.74	2.6	16 57.1	12 32.1	+ 7 2.4	-1.2140	0.5205	0.2192	-30-73
7 Leonis	6.2	1.77	3.9	14 45.5	17 41.2	-11 58.1	-0.0173	0.5192	0.2261	+43-39
11 Leonis	6.5	1.78	4.0	14 43.9	18 45.2	-10 56.0	-0.2296	0.5190	0.2274	+31-59
ψ Leonis	5.6	+1.81	- 4.4	+14 24.6	21 35.0	- 8 10.6	-0.5392	0.5184	-0.2310	+15-69
ν Leonis	5.0	1.86	5.7	12 50.9	21 4 51.6	- 1 8.3	-0.5886	0.5172	0.2394	+13-73
A Leonis	4.6	1.88	7.1	10 24.8	9 44.4	+ 3 35.6	+0.8065	0.5166	0.2446	+90+ 1
α Leonis	1.3	1.90	6.4	12 22.9	9 58.0	+ 3 48.7	-1.3278	0.5166	0.2448	-40-78
44 Leonis	5.9	1.96	8.4	9 12.9	18 27.9	-11 56.9	-0.1053	0.5161	0.2529	+38-47
48 Leonis	5.2	+1.98	- 9.4	+ 7 23.3	23 16.0	- 7 16.7	+0.5808	0.5162	-0.2569	+80-12
49 Leonis	5.7	2.00	8.8	9 5.2	23 23.3	- 7 10.5	-1.2247	0.5162	0.2570	-28-81
37 Sextantis	6.3	2.03	10.2	6 49.1	22 4 57.4	- 1 46.5	-0.2933	0.5165	0.2611	+28-59
56 Leonis	6.1	2.08	10.7	6 38.2	9 56.4	+ 3 3.4	-1.4097	0.5171	0.2642	-52-73
d Leonis	5.0	2.08	11.8	4 4.2	12 13.2	+ 5 16.0	+0.6523	0.5175	0.2656	+86- 9
75 Leonis	5.4	+2.15	-13.0	+ 2 28.5	20 33.9	-10 38.7	+0.0693	0.5193	-0.2695	+47-39

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
MAY.



ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
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**MENTS FOR THE PREDICTION OF OCCULTATIONS.  
JUNE.**

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
JUNE.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
JUNE.

THE STAR'S					AT CONJUNCTION IN R. A.					Limiting Par- allels.				
Name.	Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	N.	S.			
		Δα	Δδ											
		s	"	°	'	d	h	m	h	m		°	'	
Sagittarii	4.7	+4.10	+ 2.9	-25	4.3	27	13	41.4	+ 0 30.9	+0.8983	0.5947	+0.1428	+65	+ 9
Sagittarii	6.3	4.04	3.1	23	37.3		14	54.3	+ 1 40.8	-0.3681	0.5935	0.1461	+ 8	-66
B. Sagittarii	6.1	4.04	3.1	23	37.4		15	1.0	+ 1 47.3	-0.3491	0.5934	0.1463	+10	-66
B. Sagittarii	6.3	4.03	4.4	24	9.1		20	30.1	+ 7 3.1	+1.0203	0.5880	0.1606	+66	+17
B. Sagittarii	6.1	3.98	5.2	22	58.2		23	17.9	+ 9 44.2	+0.3007	0.5851	0.1674	+46	-27
B. Sagittarii	6.5	+3.97	+ 5.5	-22	50.0	28	0	13.7	+10 37.7	+0.3203	0.5841	+0.1697	+46	-26
Capricorni	5.7	3.91	6.8	22	4.3		5	56.6	- 7 52.7	+0.5675	0.5781	0.1824	+62	-12
Capricorni	5.3	3.73	8.3	18	26.2		15	2.1	+ 0 52.1	-1.3381	0.5684	0.2013	-57	-72
B. Capricorni	6.4	3.70	9.1	18	20.8		18	56.6	+ 4 37.9	-0.6289	0.5642	0.2084	+ 2	-87
Capricorni	5.7	3.67	9.6	18	14.6		21	16.1	+ 6 52.4	-0.2455	0.5617	0.2124	+22	-57
Capricorni	6.2	+3.69	+10.2	-19	21.8		23	18.9	+ 8 50.7	+1.3256	0.5595	+0.2158	+71	+46
Capricorni	6.5	3.64	10.1	17	51.6		23	52.6	+ 9 23.2	-0.0735	0.5589	0.2167	+31	-47
Capricorni	4.2	3.62	10.4	17	34.1	29	2	4.7	+11 30.6	+0.1120	0.5566	0.2202	+41	-37
B. Capricorni	6.1	3.58	11.3	17	41.6		6	5.9	- 8 36.7	+1.1379	0.5524	0.2260	+72	+23
URANUS	6.0	...	...	16	59.3		6	21.6	- 8 21.6	+0.4796	0.5533	0.2268	+63	-18
Capricorni	5.5	+3.53	+10.8	-15	31.3		6	24.1	- 8 19.1	-1.0008	0.5521	+0.2264	-18	-90
Capricorni	4.3	3.54	11.8	17	11.6		9	16.4	- 5 32.9	+1.3561	0.5492	0.2303	+70	+50
Capricorni	5.1	3.39	12.5	14	25.4		18	3.9	+ 2 56.7	+0.6047	0.5405	0.2407	+72	-11
Capricorni	6.0	3.39	12.8	14	47.1		18	45.6	+ 3 37.0	+1.1432	0.5399	0.2414	+75	+22
B. Capricorni	6.1	3.32	13.0	13	7.0		21	50.6	+ 6 35.9	+0.1813	0.5370	0.2445	+49	-34
B. Aquarii	6.0	+3.12	+13.9	- 9	27.6	30	10	49.5	- 4 50.4	-0.3458	0.5260	+0.2546	+23	-63
Aquarii	5.3	3.09	13.8	8	14.7		12	26.9	- 3 16.2	-1.1926	0.5247	0.2555	-26	-90
B. Aquarii	6.1	3.03	14.0	6	59.1		17	54.6	+ 2 1.3	-1.1011	0.5207	0.2584	-19	-90
G. Aquarii	6.3	3.01	14.9	8	20.1		21	25.1	+ 5 25.3	+1.2148	0.5183	0.2598	+82	+27
Aquarii	6.4	+2.97	+14.9	- 7	24.2		23	52.1	+ 7 47.9	+0.8817	0.5167	+0.2607	+83	+ 3

JULY.

B. Aquarii	5.8	+2.88	+15.0	- 5 26.2	1	5	55.5	-10 19.6	+0.4081	0.5130	+0.2622	+66 -22
G. Aquarii	6.3	2.87	15.0	5 15.6		7	0.2	- 9 16.9	+0.5061	0.5124	0.2624	+73 -17
B. Aquarii	6.1	+2.85	+15.2	- 5 9.9		9	10.5	- 7 10.5	+0.9764	0.5112	+0.2628	+85 + 9
B. Piscium	6.4	2.68	14.6	0 10.3		20	35.9	+ 3 54.8	-1.2889	0.5059	0.2631	-32 -90
Piscium	6.4	2.65	15.4	- 1 33.1	2	1	1.3	+ 8 12.5	+1.3380	0.5042	0.2626	+86 +39
Piscium	5.7	2.59	14.6	+ 1 38.1		3	22.2	+10 29.3	-1.4326	0.5034	0.2622	-59 -66
Piscium	4.6	2.56	14.8	1 19.0		6	21.9	-10 36.3	-0.3110	0.5025	0.2615	+27 -61
Piscium	5.8	+2.50	+14.8	+ 2 27.7		11	37.7	- 5 29.5	-0.1620	0.5012	+0.2601	+35 -52
Piscium	6.2	2.51	15.1	1 37.3		12	13.4	- 4 54.8	+0.8905	0.5010	0.2599	+90 + 3
Piscium	5.6	2.28	14.6	6 29.4	3	9	17.1	- 8 26.8	+1.0390	0.4989	0.2494	+90 +14
B. Piscium	6.5	2.24	13.9	8 53.7		14	0.7	- 3 51.2	-0.3940	0.4991	0.2462	+23 -63
Piscium	6.3	2.11	13.1	12 30.3	4	3	33.4	+ 9 18.4	-1.0621	0.5007	0.2351	-16 -77
Piscium	3.7	+2.00	+12.6	+14 54.7		16	44.5	- 1 53.3	-0.6842	0.5039	+0.2219	+ 7 -75
Piscium	6.2	1.98	12.8	14 13.9		19	0.2	+ 0 18.5	+0.5613	0.5046	0.2193	+79 - 9
Piscium	6.1	1.97	12.4	15 58.7		21	1.9	+ 2 16.7	-0.9146	0.5052	0.2170	- 7 -74
Arietis	6.4	1.94	12.1	16 59.5	5	0	37.9	+ 5 46.4	-1.2549	0.5065	0.2127	-34 -73
Arietis	5.8	1.93	12.2	16 32.2		1	28.0	+ 6 35.0	-0.5782	0.5068	0.2117	+13 -69
Arietis	5.1	+1.90	+12.0	+17 24.4		6	12.8	+11 11.5	-0.5453	0.5085	+0.2057	+14 -66
B. Arietis	6.4	1.87	11.8	17 50.9		9	29.4	- 9 37.7	-0.3660	0.5098	0.2014	+24 -55
B. Arietis	6.5	1.85	12.0	17 37.7		11	34.5	- 7 36.3	+0.2937	0.5107	0.1986	+61 -20
H <sup>1</sup> . Arietis	6.4	1.85	12.1	16 49.8		12	24.3	- 6 48.0	+1.3394	0.5110	0.1974	+75 +53
Arietis	5.9	1.84	11.4	19 6.2		13	1.2	- 6 12.2	-1.0475	0.5113	0.1966	-17 -71
Arietis	5.6	+1.82	+11.4	+19 30.7		16	50.6	- 2 29.6	-0.7582	0.5130	+0.1911	+ 2 -70
Arietis	6.2	1.78	11.4	19 28.9		23	9.9	+ 3 38.2	+0.4530	0.5158	0.1817	+72 -10
Arietis	5.4	1.75	10.7	21 35.8	6	3	14.4	+ 7 35.3	-1.1602	0.5178	0.1752	-28 -68
Arietis	5.7	1.74	11.3	19 39.2		5	1.8	+ 9 19.4	+1.3029	0.5186	0.1724	+79 +52
Arietis (mean)	4.6	1.68	10.8	21 0.2		13	20.0	- 6 37.8	+1.1814	0.5228	0.1583	+90 +39
Arietis	5.8	+1.62	+ 9.6	+24 25.6	7	1	26.8	+ 5 6.0	-0.8300	0.5289	+0.1360	- 4 -66

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
JULY.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

JULY.

THE STAR'S					AT CONJUNCTION IN R. A.					Limiting Par- allels.	
Name.	Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	N.	S.
		Δα	Δδ								
		s	"	° '	d h m	h m				°	°
G. Virginis	5.7	+2.71	-19.6	-18 19.7	19 23 40.7	- 6 43.8	-0.6276	0.5596	-0.2077	+ 2	-87
G. Libræ	6.5	2.85	19.8	20 4.3	20 6 30.4	- 0 9.0	-0.2368	0.5659	0.1949	+20	-57
G. Libræ	6.4	2.94	19.8	20 49.3	11 12.0	+ 4 22.0	-0.3725	0.5703	0.1854	+13	-66
G. Libræ	6.1	2.95	19.8	20 58.5	11 37.6	+ 4 46.7	-0.2973	0.5707	0.1845	+16	-61
B. Libræ	5.7	3.07	20.4	21 2.3	15 45.7	+ 8 45.3	-0.9755	0.5745	0.1754	-22	-90
G. Libræ	6.1	+3.10	-19.4	-21 42.4	19 24.9	-11 43.9	-0.9277	0.5779	-0.1670	-20	-90
G. Libræ	5.8	3.18	19.0	22 5.4	23 22.2	- 7 55.9	-1.1826	0.5815	0.1575	-41	-90
B. Libræ	6.3	3.34	18.9	24 12.4	21 5 55.1	- 1 38.6	-0.0348	0.5873	0.1407	+25	-45
Libræ	5.0	3.38	18.3	23 32.9	8 41.1	+ 1 0.7	-1.0738	0.5896	0.1333	-34	-90
Scorpii	4.7	3.49	18.3	25 29.9	12 45.7	+ 4 55.4	+0.3601	0.5929	0.1219	+44	-23
Scorpii	4.6	+3.50	-18.0	-25 4.7	13 46.1	+ 5 53.3	-0.1814	0.5937	-0.1190	+15	-54
B. Scorpii	5.4	3.49	17.7	24 17.1	13 53.2	+ 6 0.1	-0.9892	0.5938	0.1187	-29	-90
Scorpii	5.9	3.51	17.9	24 59.8	14 10.0	+ 6 16.2	-0.3102	0.5940	0.1179	+ 9	-63
Scorpii	5.7	3.53	18.2	26 1.3	14 28.5	+ 6 34.0	+0.6776	0.5942	0.1170	+63	- 5
B. Scorpii	5.4	3.53	17.5	24 35.5	15 39.6	+ 7 42.2	-0.8885	0.5951	0.1136	-23	-90
Scorpii	3.0	+3.56	-17.9	-25 52.5	15 44.8	+ 7 47.1	+0.3852	0.5952	-0.1133	+45	-22
B. Scorpii	4.9	3.58	17.5	25 38.0	17 26.9	+ 9 25.0	-0.0447	0.5964	0.1083	+22	-46
B. Scorpii	6.4	3.57	17.2	24 29.8	17 40.5	+ 9 38.0	-1.2051	0.5966	0.1077	-48	-88
B. Scorpii	5.5	3.64	17.3	26 6.3	19 14.0	+11 7.8	+0.2364	0.5977	0.1030	+36	-30
B. Scorpii	6.0	3.66	16.6	25 16.0	21 46.8	-10 25.9	-0.8527	0.5995	0.0953	-23	-90
Scorpii	3.1	+3.71	-16.2	-25 23.7	22 0 7.4	- 8 11.2	-0.9396	0.6010	-0.0881	-29	-90
Scorpii	1.2	3.78	15.9	26 14.9	3 9.4	- 5 16.9	-0.3395	0.6028	0.0786	+ 3	-65
B. Scorpii	6.2	3.80	15.7	26 21.5	3 53.1	- 4 35.0	-0.2871	0.6032	0.0763	+ 6	-61
Scorpii	2.9	3.87	15.9	28 2.7	5 31.0	- 3 1.3	+1.2744	0.6041	0.0711	+62	+55
B. Scorpii	6.4	3.91	15.0	27 18.1	8 36.8	- 0 3.4	+0.3287	0.6056	0.0611	+37	-25
B. Ophiuchi	6.2	+4.02	-12.8	-26 24.2	16 51.3	+ 7 49.9	-0.9573	0.6089	-0.0338	-35	-90
G. Ophiuchi	6.1	4.09	12.6	27 39.7	18 50.4	+ 9 43.8	+0.2349	0.6094	0.0271	+29	-30
Ophi. (1st star)	5.4	4.05	12.7	26 29.0	19 56.1	+10 46.7	-0.9653	0.6097	0.0234	-36	-90
Ophiuchi	5.4	4.17	11.7	28 3.9	22 47.4	-10 29.5	+0.5555	0.6102	-0.0137	+48	-12
G. Ophiuchi	6.3	4.26	9.7	27 50.8	23 5 59.1	- 3 36.5	+0.3284	0.6109	+0.0109	+33	-25
Sagittarii (var.)	4.4	+4.28	- 9.2	-27 48.1	7 31.5	- 2 8.2	+0.3047	0.6108	+0.0161	+32	-26
G. Sagittarii	6.2	4.26	9.0	26 56.9	7 51.8	- 1 48.7	-0.5383	0.6108	0.0173	-12	-81
G. Sagittarii	5.7	4.34	8.3	28 3.3	10 49.1	+ 1 0.9	+0.6274	0.6106	0.0274	+54	- 7
B. Sagittarii	4.7	4.40	7.2	28 28.2	14 55.8	+ 4 56.9	+1.1810	0.6100	0.0413	+62	+36
G. Sagittarii	6.3	4.43	6.3	28 19.1	18 18.3	+ 8 10.6	+1.1896	0.6091	0.0526	+62	+37
B. Sagittarii	4.7	+4.38	- 5.9	-27 4.5	18 34.1	+ 8 25.8	-0.0319	0.6091	+0.0535	+17	-45
G. Sagittarii	6.2	4.41	4.8	26 41.2	22 5.8	+11 48.3	-0.2085	0.6080	0.0652	+ 9	-56
G. Sagittarii	6.3	4.41	4.8	26 48.6	22 13.9	+11 56.1	-0.0774	0.6079	0.0656	+16	-48
B. Sagittarii	6.5	4.40	4.7	26 38.3	22 32.6	-11 46.0	-0.2280	0.6078	0.0667	+ 8	-57
Sagittarii	3.3	4.48	2.9	27 4.8	24 4 39.6	- 5 54.6	+0.6803	0.6051	0.0865	+61	- 5
Sagittarii	2.1	+4.47	- 1.7	-26 24.2	8 13.4	- 2 29.9	+0.3360	0.6032	+0.0977	+41	-24
B. Sagittarii	6.4	4.42	1.2	24 59.5	9 23.2	- 1 23.1	-0.9543	0.6026	0.1013	-29	-90
G. Sagittarii	6.4	4.43	0.9	25 3.7	10 9.3	- 0 38.9	-0.8060	0.6021	0.1037	-19	-90
B. Sagittarii	5.8	4.43	0.8	24 57.9	10 55.4	+ 0 5.3	-0.8214	0.6016	0.1060	-20	-90
B. Sagittarii	6.1	4.44	- 0.1	24 47.5	13 5.1	+ 2 9.5	-0.7589	0.6003	0.1126	-16	-90
B. Sagittarii	5.9	+4.49	+ 0.3	-26 3.0	14 56.4	+ 3 56.2	+0.7096	0.5990	+0.1181	+64	- 3
Sagittarii	4.9	4.47	0.7	25 24.2	15 49.1	+ 4 46.7	+0.1706	0.5985	0.1207	+33	-34
B. Sagittarii	6.1	4.44	0.8	24 19.5	15 50.1	+ 4 47.6	-0.9029	0.5985	0.1207	-24	-90
Sagittarii	4.9	4.46	1.8	24 40.4	19 30.9	+ 8 19.3	-0.0910	0.5958	0.1314	+21	-49
Sagittarii	5.5	4.44	1.9	24 7.7	19 36.6	+ 8 24.8	-0.6221	0.5957	0.1317	- 6	-89
Sagittarii	5.8	+4.48	+ 3.0	-24 54.3	23 37.7	-11 43.9	+0.7040	0.5926	+0.1428	+65	- 4
Sagittarii	4.7	4.49	3.1	25 4.3	23 53.1	-11 29.2	+0.9066	0.5924	0.1435	+65	+ 9
Sagittarii	6.3	4.43	3.5	23 37.3	25 1 6.6	-10 18.7	-0.3636	0.5915	0.1469	+ 9	-66
B. Sagittarii	6.1	4.44	3.6	23 37.4	1 13.4	-10 12.2	-0.3444	0.5914	0.1472	+10	-65
B. Sagittarii	6.3	4.46	4.9	24 9.1	6 44.6	- 4 54.3	+1.0369	0.5867	0.1615	+66	+18
B. Sagittarii	6.1	+4.42	+ 6.0	-22 58.2	9 33.2	- 2 12.3	+0.3186	0.5843	+0.1685	+46	-26

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
JULY.

## ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

AUGUST.

THE STAR'S

AT CONJUNCTION IN R. A.

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16.0	8	19	2.3	+	0 9 2	+0.7362	0.5335	+0.1146	+90	+13		
50.8		19	43.2	+	0 48.7	+1.2792	0.5338	0.1132	+75	+56		
19.6		21	1.3	+	2 4.3	-0.2143	0.5344	0.1105	+31	-36		
15.8	4	6	32.5	+11	16.6	-0.2968	0.5383	0.0898	+26	-39		
9.1		10	54.5	-	8 30.2	-0.9098	0.5400	0.0800	-10	-63		
26.0		11	57.4	-	7 29.3	-1.0763	0.5404	+0.0776	+90	+39		
45.5	5	1	38.5	+	5 44.0	-0.6547	0.5449	0.0456	+6	-58		
34.8		6	58.7	+10	53.1	-0.2485	0.5463	0.0327	+29	-30		
55.6		9	16.1	-10	54.1	-0.5627	0.5469	0.0271	+11	-50		
52.5		14	18.2	-	6 2.5	-0.3992	0.5480	0.0147	+21	-38		
32.3		16	39.5	-	3 46.1	-1.1054	0.5483	+0.0089	-28	-61		
36.6		20	58.4	+	0 23.9	-0.0633	0.5490	-0.0018	+40	-18		
52.4		21	31.8	+	0 56.1	+0.7475	0.5491	0.0032	+90	+24		
56.7	6	3	39.8	+	6 51.4	-0.5009	0.5496	0.0185	+15	-45		
35.7		4	43.2	+	7 52.6	-0.1354	0.5497	0.0211	+35	-23		
34.2		8	8.2	+11	10.4	-0.1950	0.5499	-0.0296	+32	-27		
29.0	7	8	24.6	+10	36.5	+0.6501	0.5480	0.0890	+90	+11		
11.7		9	58.0	-11	53.4	-0.2695	0.5477	0.0927	+28	-37		
1.9		10	15.9	-11	36.1	-0.1186	0.5477	0.0934	+37	-29		
16.4		16	8.9	-	5 55.1	+1.2138	0.5464	0.1071	+87	+48		
2.1		17	9.2	-	4 56.9	+0.2725	0.5462	-0.1094	+60	-10		
12.9		21	8.1	-	1 6.1	-0.3789	0.5452	0.1185	+22	-46		
33.1	8	3	52.7	+	5 24.8	-0.5044	0.5433	0.1334	+15	-55		
25.0		4	19.2	+	5 50.3	-0.4160	0.5431	0.1344	+20	-50		
13.0		5	9.3	+	6 38.7	+0.7762	0.5428	0.1361	+90	+13		
NEW MOON.												
4.3	12	6	32.3	+	4 57.5	+0.1932	0.5163	-0.2659	+54	-33		
24.9		9	46.6	+	8 5.9	+1.0656	0.5163	0.2671	+90	+14		
28.5		15	0.7	-10	49.4	-0.4013	0.5165	0.2687	+23	-66		
6.8		15	50.4	-10	1.3	-0.2460	0.5166	-0.2689	+31	-57		
35.8		18	3.6	-	7 52.1	+0.7423	0.5168	0.2693	+90	-5		
52.3		18	25.7	-	7 30.7	-0.6891	0.5168	0.2693	+8	-90		
21.4	13	0	56.5	-	1 11.7	-0.1203	0.5176	0.2700	+37	-50		
58.1		1	40.5	-	0 29.1	+1.3598	0.5178	0.2700	+83	+41		
15.0		19	33.0	-	7 9.5	-0.0470	0.5223	-0.2670	+40	-46		
59.2	14	5	5.8	+	2 5.4	+1.2848	0.5260	0.2626	+81	+33		
31.9		7	44.9	+	4 39.5	-0.9110	0.5272	0.2609	-6	-90		
11.5		14	58.2	+11	38.9	+0.9939	0.5308	0.2557	+79	+11		
4.9		14	59.5	+11	40.2	-1.1838	0.5308	0.2557	-26	-90		
55.8	15	8	56.1	+	5 1.3	+0.3879	0.5418	-0.2373	+59	-23		
45.4		14	12.1	+10	6.6	+0.0013	0.5454	0.2304	+37	-43		
20.7		14	41.8	+10	35.3	-0.5331	0.5458	0.2297	+10	-77		
48.6	16	3	50.7	-	0 43.5	-0.9037	0.5557	0.2090	-14	-90		
11.7		4	33.5	-	0 2.2	-0.6588	0.5562	0.2077	0	-90		
19.7		5	14.4	+	0 37.3	-0.6656	0.5568	-0.2065	-90			
4.3		12	9.0	+	7 16.9	-0.2715	0.5622	0.1935	+19	-59		
49.3		16	54.6	+11	52.0	-0.4075	0.5661	0.1838	+11	-69		
58.4		17	20.6	-11	42.9	-0.3316	0.5664	0.1829	+15	-63		
2.3		21	32.6	-	7 40.4	-1.0147	0.5697	0.1738	-25	-90		
42.4	17	1	15.7	-	4 5.7	-0.9663	0.5727	-0.1653	-23	-90		
5.4		5	17.4	-	0 13.2	-1.2232	0.5758	0.1558	-45			
12.4		11	58.3	+	6 12.1	-0.0632	0.5808	0.1390	+23	-47		
32.8		14	47.9	+	8 55.0	-1.1126	0.5828	0.1315	-37	-90		
29.9		18	57.9	-11	4.9	+0.3376	0.5856	0.1202	+43	-25		
4.7		19	59.8	-10	5.5	-0.2097	0.5864	-0.1174	+14	-56		



ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
AUGUST.

THE STAR'S					AT CONJUNCTION IN R. A.					Limiting Parallels.	
Name.	Mag.	Red'ns from 1915.0.		Apparent Declination.	Washington Mean Time.	Hour Angle, H	Y	x'	y'	N.	S.
		Δα	Δδ								
		s	"	°	d h m	h m					
31 B. Scorpii	5.4	+3.16	-17.2	-24 17.1	17 20 7.1	- 9 58.5	-1.0265	0.5864	-0.1170	-32	-90
3 Scorpii	5.9	3.17	17.4	24 59.8	20 24.3	- 9 41.9	-0.3398	0.5866	0.1162	+ 7	-65
4 Scorpii	5.7	3.20	17.8	26 1.3	20 43.2	- 9 23.8	+0.6591	0.5868	0.1153	+61	- 6
40 B. Scorpii	5.4	3.20	17.1	24 35.5	21 56.0	- 8 13.9	-0.9244	0.5876	0.1119	-26	-90
π Scorpii	3.0	3.22	17.6	25 52.5	22 1.3	- 8 8.9	+0.3638	0.5877	0.1117	+43	-23
48 B. Scorpii	4.9	+3.25	-17.2	-25 38.0	23 45.8	- 6 28.6	-0.0705	0.5888	-0.1067	+20	-48
50 B. Scorpii	6.4	3.24	16.8	24 29.8	23 59.8	- 6 15.2	-1.2443	0.5889	0.1061	-53	-81
65 B. Scorpii	5.5	3.31	17.1	26 6.2	18 1 35.7	- 4 43.1	+0.2142	0.5899	0.1015	+34	-31
85 B. Scorpii	6.0	3.34	16.4	25 16.0	4 12.3	- 2 12.9	-0.8872	0.5914	0.0938	-25	-90
σ Scorpii	3.1	3.39	16.0	25 23.7	6 36.5	+ 0 5.4	-0.9747	0.5927	0.0867	-32	-90
α Scorpii	1.2	+3.47	-15.8	-26 14.9	9 43.3	+ 3 4.5	-0.3668	0.5943	-0.0773	+ 2	-67
116 B. Scorpii	6.2	3.49	15.7	26 21.5	10 28.1	+ 3 47.5	-0.3135	0.5946	0.0750	+ 5	-63
τ Scorpii	2.9	3.56	16.0	28 2.7	12 8.8	+ 5 24.1	+1.2683	0.5954	0.0698	+62	+32
134 B. Scorpii	6.4	3.61	15.1	27 18.1	15 19.6	+ 8 26.9	+0.3112	0.5968	0.0599	+36	-26
118 B. Ophiuchi	6.2	3.76	13.1	26 24.2	23 48.1	- 7 25.8	-0.9898	0.5995	0.0330	-37	-90
95 G. Ophiuchi	6.1	+3.83	-13.1	-27 39.7	19 1 50.7	- 5 28.3	+0.2187	0.6000	-0.0264	+29	-31
36 Ophi. (1st star)	5.4	3.80	13.1	26 29.0	2 58.3	- 4 23.5	-0.9973	0.6002	0.0228	-39	-90
43 Ophiuchi	5.4	3.92	12.3	28 3.9	5 54.6	- 1 34.6	+0.5446	0.6007	0.0133	+47	-12
163 G. Ophiuchi	6.3	4.05	10.4	27 50.8	13 19.2	+ 5 31.3	+0.3162	0.6012	-0.0109	+33	-25
X Sagittarii (var.)	4.4	4.08	10.0	27 48.1	14 54.3	+ 7 2.3	+0.2925	0.6012	+0.0161	+31	-27
4 G. Sagittarii	6.2	+4.06	- 9.6	-26 56.9	15 15.2	+ 7 22.4	-0.5620	0.6011	+0.0172	-13	-83
10 G. Sagittarii	5.7	4.15	9.1	28 3.3	18 17.8	+10 17.3	+0.6202	0.6009	0.0272	+54	- 8
38 B. Sagittarii	4.7	4.23	8.2	28 28.2	22 31.9	- 9 39.3	+1.1823	0.6003	0.0408	+62	+36
48 G. Sagittarii	6.3	4.28	7.3	28 19.1	20 2 0.4	- 6 19.6	+1.1917	0.5995	0.0520	+62	+37
66 B. Sagittarii	4.7	4.24	6.7	27 4.6	2 16.6	- 6 4.0	-0.0464	0.5995	0.0529	+16	-46
68 G. Sagittarii	6.2	+4.28	- 5.6	-26 41.3	5 54.7	- 2 35.0	-0.2246	0.5985	+0.0644	+ 8	-57
69 G. Sagittarii	6.3	4.29	5.6	26 48.6	6 3.0	- 2 27.1	-0.0918	0.5984	0.0648	+15	-49
86 B. Sagittarii	6.5	4.28	5.5	26 38.3	6 22.2	- 2 8.7	-0.2443	0.5983	0.0658	+ 8	-53
φ Sagittarii	3.3	4.39	3.8	27 4.8	12 39.9	+ 3 53.4	+0.6772	0.5959	0.0853	+61	- 5
σ Sagittarii	2.1	4.40	2.6	26 24.2	16 19.8	+ 7 24.3	+0.3290	0.5942	0.0964	+40	-25
162 B. Sagittarii	6.4	+4.36	- 1.9	-24 59.5	17 31.6	+ 8 33.1	-0.9780	0.5936	+0.1000	-31	-90
127 G. Sagittarii	6.4	4.38	1.6	25 3.7	18 19.0	+ 9 18.5	-0.8275	0.5932	0.1023	-21	-90
172 B. Sagittarii	5.8	4.38	1.5	24 57.9	19 6.4	+10 4.0	-0.8430	0.5928	0.1047	-21	-90
189 B. Sagittarii	6.1	4.40	0.7	24 47.5	21 19.7	-11 48.1	-0.7791	0.5916	0.1111	-17	-90
201 B. Sagittarii	5.9	4.47	0.5	26 3.0	23 14.0	- 9 58.5	+0.7083	0.5905	0.1166	+64	- 3
ψ Sagittarii	4.9	+4.45	- 0.1	-25 24.3	21 0 8.1	- 9 6.6	+0.1627	0.5899	+0.1192	+33	-34
208 B. Sagittarii	6.1	4.42	+ 0.1	24 19.5	0 9.2	- 9 5.5	-0.9243	0.5899	0.1192	-25	-90
χ Sagittarii	4.9	4.46	1.2	24 40.5	3 55.9	- 5 28.0	-0.1016	0.5876	0.1297	+20	-49
49 Sagittarii	5.5	4.44	1.3	24 7.8	4 1.6	- 5 22.4	-0.6392	0.5876	0.1300	- 7	-90
51 Sagittarii	5.8	4.50	2.3	24 54.3	8 9.0	- 1 24.9	+0.7035	0.5848	0.1411	+65	- 4
h Sagittarii	4.7	+4.52	+ 2.4	-25 4.3	8 24.8	- 1 9.7	+0.9086	0.5846	+0.1418	+65	- 9
53 Sagittarii	6.3	4.47	3.0	23 37.3	9 40.1	+ 0 2.6	-0.3765	0.5837	0.1451	+ 8	-07
274 B. Sagittarii	6.1	4.47	3.0	23 37.4	9 47.1	+ 0 9.3	-0.3570	0.5836	0.1454	+ 0	-65
308 B. Sagittarii	6.3	4.53	4.3	24 9.1	15 26.3	+ 5 35.3	+1.0407	0.5796	0.1597	+66	+19
329 B. Sagittarii	6.1	4.51	5.6	22 58.2	18 18.9	+ 8 21.2	+0.3147	0.5774	0.1667	+46	-26
336 B. Sagittarii	6.5	+4.51	+ 5.9	-22 50.0	19 16.1	+ 9 16.2	+0.3358	0.5766	+0.1689	+47	-25
4 Capricorni	5.7	4.51	7.5	22 4.3	22 1 7.4	- 9 5.8	+0.5935	0.5720	0.1822	+63	-11
υ Capricorni	5.3	4.42	10.5	18 26.1	10 23.2	- 0 10.7	-1.3175	0.5645	0.2012	-51	-78
81 B. Capricorni	6.4	4.43	11.5	18 20.8	14 21.1	+ 3 38.6	-0.5960	0.5612	0.2086	+ 4	-83
19 Capricorni	5.7	4.44	12.1	18 14.6	16 42.3	+ 5 54.6	-0.2065	0.5593	0.2128	+24	-55
21 Capricorni	6.5	+4.43	+12.8	-17 51.6	19 20.4	+ 8 27.1	-0.0299	0.5571	+0.2173	+34	-45
θ Capricorni	4.2	4.43	13.3	17 34.1	21 33.7	+10 35.7	+0.1595	0.5554	0.2209	+44	-35
URANUS	6.0	...	...	17 35.0	22 17.8	+11 18.2	+0.3382	0.5564	0.2225	+54	-25
114 B. Capricorni	6.1	4.43	14.2	17 41.6	23 1 36.3	- 9 30.2	+1.1943	0.5520	0.2271	+72	-28
29 Capricorni	5.5	4.37	14.5	15 31.3	1 54.6	- 9 12.6	-0.9525	0.5518	0.2275	-15	-90
42 Capricorni	5.1	+4.34	+16.8	-14 25.3	13 34.8	+ 2 3.6	+0.6709	0.5428	+0.2428	+75	- 8

MENTS FOR THE PREDICTION OF OCCULTATIONS.  
AUGUST.

SEPTEMBER

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
SEPTEMBER.

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

SEPTEMBER.

THE STAR'S					AT CONJUNCTION IN R. A.					Limit- ing Par- allels.		
Name.	Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle. <i>H</i>		<i>Y</i>	<i>x'</i>	<i>y'</i>	<i>N.</i>	<i>S.</i>
		$\Delta\alpha$	$\Delta\delta$									
		<i>s</i>	<i>"</i>	<i>°</i> <i>'</i>	<i>d</i> <i>h</i> <i>m</i>	<i>h</i> <i>m</i>					<i>°</i>	<i>'</i>
B. Scorpii	5.4	+2.76	-15.9	24 35.5	14 3 16.0	- 1 6.6	-0.8282	0.5885	-0.1119	-19	-90	
Scorpii	3.0	2.78	16.4	25 52.5	3 21.3	- 1 1.5	+0.4591	0.5885	0.1117	+50	-18	
B. Scorpii	4.9	2.81	16.0	25 38.0	5 5.8	+ 0 38.7	+0.0252	0.5894	0.1067	+25	-42	
B. Scorpii	6.4	2.80	15.6	24 29.8	5 19.7	+ 0 52.1	-1.1481	0.5895	0.1060	-43	-90	
B. Scorpii	5.5	2.86	16.0	26 6.2	6 55.6	+ 2 24.1	+0.3101	0.5902	0.1014	+40	-26	
B. Scorpii	6.0	+2.89	-15.4	25 16.0	9 32.3	+ 4 54.5	-0.7912	0.5915	-0.0937	-19	-90	
Scorpii	3.1	2.94	15.2	25 23.6	11 56.8	+ 7 13.1	-0.8790	0.5924	0.0865	-25	-90	
Scorpii	1.2	3.02	15.0	26 14.9	15 4.0	+10 12.7	-0.2707	0.5936	0.0771	+ 7	-60	
B. Scorpii	6.2	3.04	14.9	26 21.5	15 49.0	+10 55.8	-0.2173	0.5938	0.0748	+10	-56	
B. Scorpii	6.4	3.16	14.5	27 18.1	20 41.8	- 8 23.5	+0.4086	0.5953	0.0597	+42	-20	
B. Ophiuchi	6.2	+3.31	-12.8	26 24.2	15 5 13.9	- 0 12.6	-0.8966	0.5969	-0.0329	-31	-90	
G. Ophiuchi	6.1	3.38	12.8	27 39.7	7 17.6	+ 1 45.9	+0.3161	0.5971	0.0264	+34	-25	
Ophi. (1st star)	5.4	3.35	13.0	26 29.0	8 25.9	+ 2 51.4	-0.9048	0.5972	0.0227	-32	-90	
Ophiuchi	5.4	3.47	12.2	28 3.9	11 24.0	+ 5 42.1	+0.6433	0.5973	0.0132	+55	- 6	
G. Ophiuchi	6.0	3.49	10.9	26 12.5	14 34.8	+ 8 45.0	-1.2626	0.5972	-0.0031	-63	-72	
G. Ophiuchi	6.3	+3.61	-10.5	27 50.8	18 54.1	-11 6.5	+0.4133	0.5969	+0.0107	+39	-20	
Sagittarii (var.)	4.4	3.64	10.2	27 48.1	20 30.5	- 9 34.1	+0.3894	0.5967	0.0158	+37	-21	
G. Sagittarii	6.2	3.63	9.8	26 56.9	20 51.7	- 9 13.8	-0.4701	0.5966	0.0169	- 8	-75	
G. Sagittarii	5.7	3.72	9.5	28 3.3	23 57.0	- 6 16.2	+0.7188	0.5961	0.0267	+62	- 2	
B. Sagittarii	4.7	3.83	7.2	27 4.6	16 8 3.7	+ 1 30.5	+0.0464	0.5939	0.0521	+21	-41	
G. Sagittarii	6.2	+3.88	- 6.2	26 41.3	11 45.7	+ 5 3.4	-0.1342	0.5925	+0.0634	+13	-51	
G. Sagittarii	6.3	3.89	6.2	26 48.6	11 54.2	+ 5 11.6	-0.0003	0.5924	0.0638	+20	-43	
B. Sagittarii	6.5	3.89	6.1	26 38.3	12 13.8	+ 5 30.4	-0.1542	0.5923	0.0648	+12	-52	
B. Sagittarii	5.7	3.94	4.0	25 5.9	18 21.6	+11 23.2	-1.2655	0.5895	0.0832	-58	-75	
Sagittarii	3.3	4.01	4.6	27 4.8	18 38.9	+11 39.9	+0.7732	0.5894	0.0840	+63	+ 1	
Sagittarii	2.1	+4.05	- 3.5	26 24.3	22 23.4	- 8 44.7	+0.4209	0.5875	+0.0949	+46	-20	
B. Sagittarii	6.4	4.02	2.7	24 59.5	23 36.7	- 7 34.3	-0.8980	0.5868	0.0984	-25	-90	
G. Sagittarii	6.4	4.03	2.4	25 3.7	17 0 25.1	- 6 47.9	-0.7465	0.5864	0.1007	-15	-90	
B. Sagittarii	5.8	4.04	2.4	24 57.9	1 13.5	- 6 1.4	-0.7625	0.5859	0.1030	-16	-90	
B. Sagittarii	6.1	4.07	1.6	24 47.5	3 29.7	- 3 50.6	-0.6991	0.5846	0.1093	-12	-90	
B. Sagittarii	5.9	+4.14	- 1.5	26 3.0	5 26.5	- 1 58.5	+0.8014	0.5834	+0.1147	+64	+ 3	
Sagittarii	4.9	4.13	1.1	25 24.3	6 21.9	- 1 5.3	+0.2503	0.5828	0.1172	+38	-29	
B. Sagittarii	6.1	4.10	- 0.7	24 19.5	6 23.0	- 1 4.2	-0.8470	0.5828	0.1172	-20	-90	
Sagittarii	4.9	4.16	+ 0.2	24 40.5	10 14.9	+ 2 38.6	-0.0181	0.5803	0.1276	+25	-44	
Sagittarii	5.5	4.14	0.4	24 7.8	10 20.8	+ 2 44.3	-0.5610	0.5802	0.1278	- 3	-82	
Sagittarii	5.8	+4.22	+ 1.3	24 54.3	14 34.0	+ 6 47.7	+0.7929	0.5773	+0.1387	+65	+ 2	
Sagittarii	4.7	4.23	1.2	25 4.3	14 50.1	+ 7 3.1	+1.0000	0.5772	0.1394	+65	+16	
Sagittarii	6.3	4.19	2.0	23 37.3	16 7.3	+ 8 17.3	-0.2986	0.5762	0.1426	+12	-61	
B. Sagittarii	6.1	4.20	2.1	23 37.4	16 14.4	+ 8 24.2	-0.2790	0.5762	0.1429	+13	-60	
B. Sagittarii	6.3	4.27	3.1	24 9.2	22 1.8	-10 1.7	+1.1301	0.5720	0.1570	+66	+26	
B. Sagittarii	6.1	+4.27	+ 4.5	22 58.2	18 0 58.6	- 7 11.5	+0.3948	0.5698	+0.1638	+51	-22	
B. Sagittarii	6.5	4.27	4.9	22 50.0	1 57.2	- 6 15.2	+0.4156	0.5690	0.1660	+53	-20	
Capricorni	5.7	4.31	6.5	22 4.3	7 57.2	- 0 28.5	+0.6722	0.5645	0.1790	+67	- 6	
Capricorni	5.3	4.27	9.8	18 26.1	17 26.8	+ 8 40.5	-1.2660	0.5571	0.1978	-44	-86	
B. Capricorni	6.4	4.30	10.8	18 20.8	21 30.5	-11 24.5	-0.5398	0.5540	0.2051	+ 7	-78	
Capricorni	5.7	+4.31	+11.4	18 14.6	23 55.1	- 9 5.0	-0.1481	0.5522	+0.2092	+27	-52	
Capricorni	6.5	4.32	12.1	17 51.6	19 2 37.0	- 6 28.7	+0.0280	0.5502	0.2136	+37	-42	
URANUS	6.0	...	...	17 49.5	4 3.2	- 5 5.4	+0.3018	0.5502	0.2162	+51	-27	
Capricorni	4.2	4.32	12.7	17 34.1	4 53.4	- 4 16.9	+0.2175	0.5484	0.2172	+47	-32	
B. Capricorni	6.1	4.35	13.6	17 41.6	9 1.8	- 0 17.0	+1.2595	0.5454	0.2233	+72	+35	
Capricorni	5.5	+4.29	+14.1	15 31.3	9 20.4	+ 0 0.9	-0.9101	0.5452	+0.2238	-12	-90	
Capricorni	5.1	4.32	16.6	14 25.4	21 16.1	+11 32.7	+0.7181	0.5369	0.2390	+76	- 5	
Capricorni	6.0	4.34	16.9	14 47.0	21 58.5	-11 46.3	+1.2620	0.5365	0.2398	+75	+33	
B. Capricorni	6.1	4.30	17.8	13 6.9	20 1 6.4	- 8 44.6	+0.2902	0.5344	0.2432	+55	-28	
B. Aquarii	6.0	4.26	20.6	9 27.5	14 12.2	+ 3 56.0	-0.2424	0.5268	0.2546	+29	-57	
Aquarii	5.3	+4.24	+21.1	- 8 14.6	15 49.8	+ 5 30.6	-1.0929	0.5229	+0.2557	-19	-90	



ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
SEPTEMBER.

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ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
OCTOBER.

THE STAR'S					AT CONJUNCTION IN R. A.					Limit- ing Par- allels.	
Name.	Mag.	Red'ns from 1915.0.		Apparent Declina- tion.	Washington Mean Time.	Hour Angle, <i>H</i>	<i>Y</i>	<i>x'</i>	<i>y'</i>	<i>N.</i>	<i>S.</i>
		$\Delta\alpha$	$\Delta\delta$								
		<i>s</i>	<i>"</i>	<i>°</i> <i>'</i>	<i>d</i> <i>h</i> <i>m</i>	<i>h</i> <i>m</i>				<i>°</i>	<i>'</i>
<i>b</i> Scorpii	4.7	+2.37	-14.8	-25 29.9	11 6 54.9	+ 4 26.9	+0.5924	0.5962	-0.1209	+58	-10
<i>A</i> Scorpii	4.6	2.39	14.6	25 4.7	7 55.0	+ 5 24.6	+0.0538	0.5966	0.1180	+27	-40
31 B. Scorpii	5.4	2.38	14.4	24 17.1	8 2.1	+ 5 31.3	-0.7519	0.5967	0.1177	-15	-90
3 Scorpii	5.9	2.39	14.5	24 59.8	8 18.8	+ 5 47.4	-0.0742	0.5968	0.1169	+20	-47
4 Scorpii	5.7	2.41	14.7	26 1.2	8 37.2	+ 6 5.0	+0.9118	0.5970	0.1160	+64	+10
40 B. Scorpii	5.4	+2.41	-14.3	-24 35.4	9 48.0	+ 7 12.9	-0.6495	0.5975	-0.1125	-10	-90
$\pi$ Scorpii	3.0	2.43	14.6	25 52.5	9 53.1	+ 7 17.8	+0.6220	0.5976	0.1122	+60	-8
48 B. Scorpii	4.9	2.45	14.4	25 38.0	11 34.9	+ 8 55.4	+0.1952	0.5983	0.1071	+34	-32
50 B. Scorpii	6.4	2.44	14.1	24 29.8	11 48.5	+ 9 8.4	-0.9636	0.5984	0.1065	-29	-90
65 B. Scorpii	5.5	2.49	14.3	26 6.2	13 21.9	+10 37.9	+0.4785	0.5991	0.1018	+50	-16
85 B. Scorpii	6.0	+2.52	-13.8	-25 15.9	15 54.8	-10 55.6	-0.6075	0.6001	-0.0940	-9	-88
$\sigma$ Scorpii	3.1	2.56	13.7	25 23.6	18 15.7	- 8 40.6	-0.6922	0.6008	0.0867	-15	-90
$\alpha$ Scorpii	1.2	2.62	13.6	26 14.9	21 18.5	- 5 45.4	-0.0883	0.6017	0.0772	+16	-48
116 B. Scorpii	6.2	2.63	13.5	26 21.4	22 2.4	- 5 3.4	-0.0349	0.6020	0.0749	+19	-45
134 B. Scorpii	6.4	2.73	13.2	27 18.1	12 2 48.7	- 0 29.1	+0.5881	0.6029	0.0597	+54	-10
118 B. Ophiuchi	6.2	+2.86	-11.7	-26 24.1	11 10.2	+ 7 31.1	-0.6977	0.6037	-0.0326	-10	-90
95 G. Ophiuchi	6.1	2.92	11.8	27 39.7	13 11.6	+ 9 27.5	+0.5045	0.6037	0.0260	+46	-13
36 Ophi. ( <i>1st star</i> )	5.4	2.89	12.1	26 29.0	14 18.6	+10 31.5	-0.7040	0.6037	0.0223	-21	-90
43 Ophiuchi	5.4	3.01	11.3	28 3.9	17 13.6	-10 40.9	+0.8316	0.6034	0.0128	+62	-6
151 G. Ophiuchi	6.0	3.02	10.1	26 12.5	20 21.1	- 7 41.3	-1.0559	0.6030	-0.0026	-44	-90
163 G. Ophiuchi	6.3	+3.13	- 9.9	-27 50.8	13 0 36.4	- 3 36.8	+0.6084	0.6021	+0.0112	+52	-8
$\chi$ Sagittarii ( <i>var.</i> )	4.4	3.16	9.6	27 48.1	2 11.5	- 2 5.7	+0.5856	0.6017	0.0164	+51	-10
4 G. Sagittarii	6.2	3.15	9.2	26 56.9	2 32.4	- 1 45.7	-0.2671	0.6016	0.0175	+ 2	-60
10 G. Sagittarii	5.7	3.23	9.0	28 3.3	5 35.2	+ 1 9.4	+0.9144	0.6006	0.0273	+62	+12
66 B. Sagittarii	4.7	3.34	7.0	27 4.6	13 36.4	+ 8 50.5	+0.2503	0.5972	0.0526	+32	-29
67 B. Sagittarii	6.4	+3.31	- 6.6	-25 38.4	13 52.2	+ 9 5.7	-1.1852	0.5971	+0.0534	-51	-89
68 G. Sagittarii	6.2	3.40	6.2	26 41.3	17 16.3	-11 38.7	+0.0720	0.5954	0.0638	+24	-39
$\lambda$ Sagittarii	2.9	3.36	5.9	25 28.3	17 23.0	-11 32.2	-1.1493	0.5954	0.0642	-47	-90
69 G. Sagittarii	6.3	3.40	6.2	26 48.6	17 24.8	-11 30.5	+0.2052	0.5953	0.0643	+31	-31
86 B. Sagittarii	6.5	3.40	6.1	26 38.3	17 44.2	-11 11.9	+0.0523	0.5952	0.0653	+23	-40
126 B. Sagittarii	5.7	+3.46	- 4.2	-25 5.9	23 49.4	- 5 21.7	-1.0528	0.5916	+0.0835	-37	-90
$\varphi$ Sagittarii	3.3	3.52	4.8	27 4.8	14 0 6.6	- 5 5.2	+0.9774	0.5914	0.0843	+63	+16
$\sigma$ Sagittarii	2.1	3.56	3.8	26 24.3	3 49.9	- 1 30.9	+0.6276	0.5890	0.0951	+59	-8
162 B. Sagittarii	6.4	3.54	3.0	24 59.5	5 2.9	- 0 20.9	-0.6865	0.5881	0.0985	-13	-90
127 G. Sagittarii	6.4	3.56	2.8	25 3.7	5 51.1	+ 0 25.4	-0.5356	0.5876	0.1008	- 5	-80
172 B. Sagittarii	5.8	+3.56	- 2.8	-24 57.9	6 39.3	+ 1 11.7	-0.5515	0.5870	+0.1030	- 5	-82
189 B. Sagittarii	6.1	3.60	2.0	24 47.5	8 55.2	+ 3 22.2	-0.4882	0.5854	0.1093	- 1	-76
201 B. Sagittarii	5.9	3.66	2.1	26 3.1	10 51.8	+ 5 14.1	+1.0085	0.5839	0.1146	+64	+18
$\psi$ Sagittarii	4.9	3.66	1.6	25 24.3	11 47.0	+ 6 7.2	+0.4589	0.5832	0.1171	+50	-18
208 B. Sagittarii	6.1	3.63	1.3	24 19.5	11 48.1	+ 6 8.2	-0.6359	0.5832	0.1171	- 8	-90
$\chi$ Sagittarii	4.9	+3.69	- 0.5	-24 40.5	15 39.9	+ 9 50.9	+0.1912	0.5802	+0.1273	+36	-32
49 Sagittarii	5.5	3.67	- 0.3	24 7.8	15 45.8	+ 9 56.6	-0.3508	0.5802	0.1275	+ 8	-65
51 Sagittarii	5.8	3.76	+ 0.4	24 54.3	19 59.2	- 9 59.8	+1.0013	0.5768	0.1382	+65	+16
<i>h</i> Sagittarii	4.7	3.77	0.4	25 4.3	20 15.3	- 9 44.4	+1.2082	0.5766	0.1389	+65	+36
53 Sagittarii	6.3	3.74	1.2	23 37.3	21 32.6	- 8 30.0	-0.0894	0.5755	0.1420	+22	-48
274 B. Sagittarii	6.1	+3.74	+ 1.2	-23 37.4	21 39.8	- 8 23.1	-0.0699	0.5754	+0.1423	+23	-47
329 B. Sagittarii	6.1	3.84	3.5	22 58.2	15 6 26.0	+ 0 3.3	+0.6025	0.5680	0.1627	+63	-10
336 B. Sagittarii	6.5	3.84	3.8	22 50.0	7 24.9	+ 0 59.9	+0.6231	0.5672	0.1648	+64	-9
4 Capricorni	5.7	3.90	5.4	22 4.3	13 27.3	+ 6 49.0	+0.8787	0.5620	0.1775	+68	+7
<i>v</i> Capricorni	5.3	3.89	8.8	18 26.2	23 1.9	- 7 57.0	-1.0693	0.5538	0.1957	-26	-90
81 B. Capricorni	6.4	+3.94	+ 9.7	-18 20.8	16 3 8.2	- 3 59.4	-0.3438	0.5504	+0.2027	+17	-64
19 Capricorni	5.7	3.95	10.2	18 14.6	5 34.5	- 1 38.2	+0.0475	0.5484	0.2067	+37	-41
21 Capricorni	6.5	3.97	10.9	17 51.6	8 18.4	+ 1 0.2	+0.2224	0.5462	0.2110	+47	-31
URANUS	6.0	...	...	17 55.9	8 59.6	+ 1 39.9	+0.4417	0.5459	0.2121	+59	-10
$\theta$ Capricorni	4.2	3.99	11.4	17 34.1	10 36.5	+ 3 13.5	+0.4109	0.5444	0.2144	+58	-21
29 Capricorni	5.5	+3.98	+13.0	-15 31.3	15 7.1	+ 7 35.0	-0.7261	0.5409	+0.2208	- 1	-90

MENTS FOR THE PREDICTION OF OCCULTATIONS.  
OCTOBER.



ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
OCTOBER.

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NOVEMBER.

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ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
NOVEMBER.

XXIX

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
NOVEMBER.

THE STAR'S		AT CONJUNCTION IN R. A.						Limit- ing Pre- dict
Name.	arent time- on.	Washington Mean Time.	Angle, H	Y	X	Y	N S	
		d h m	h m					
$\rho$ Aquarii	14.6	14 3 42.5	3 1.8	-0.6676	0.5206	+0.2503	+6	-
170 B. Aquarii	37.1	5 22.5	1 24.8	-0.9035	0.5196	0.2512	-6	-
186 B. Aquarii	59.0	9 15.7	2 21.2	-0.5902	0.5174	0.2532	+11	-
67 Aquarii	24.1	15 18.2	8 12.7	+1.3881	0.5144	0.2556	+77	-
252 B. Aquarii	26.1	21 25.5	9 50.9	+0.8885	0.5118	0.2574	+85	-
197 G. Aquarii	15.5	22 30.7	8 47.7	+0.9829	0.5113	+0.2576	+85	-
22 B. Piscium	10.1	12 10.4	4 28.0	-0.8778	0.5071	0.2588	-3	-
9 Piscium	39.8	14 7.5	6 21.6	-1.2574	0.5066	0.2587	-31	-
16 Piscium	38.3	18 56.6	11 2.4	-1.0529	0.5057	0.2582	-15	-
$\lambda$ Piscium	19.2	21 55.7	10 3.7	+0.0563	0.5053	0.2577	+45	-
19 Piscium	1.4	0 13.3	7 50.0	-1.1734	0.5050	+0.2572	-25	-
22 Piscium	27.9	3 10.0	4 58.4	+0.1784	0.5047	0.2564	+53	-
25 Piscium	37.5	3 45.4	4 24.0	+1.2285	0.5047	0.2563	+90	-
51 Piscium	29.7	0 35.0	8 10.3	+1.2547	0.5053	0.2466	+90	-
136 B. Piscium	54.0	5 14.0	3 39.3	-0.2032	0.5060	0.2435	+52	-
75 Piscium	30.6	18 31.3	9 14.8	-0.9508	0.5089	+0.2327	-9	-
7 Piscium	55.0	7 25.1	2 14.1	-0.6554	0.5129	0.2195	+8	-
101 Piscium	14.1	9 37.7	0 5.4	+0.5694	0.5137	0.2169	+80	-
105 Piscium	59.0	11 36.7	1 50.0	-0.9111	0.5144	0.2146	-7	-
3 Arietis	59.8	15 7.6	5 14.7	-1.2715	0.5157	0.2103	-37	-
4 Arietis	32.5	15 56.5	6 2.1	-0.6037	0.5160	+0.2092	-11	-
1 Arietis	24.7	20 34.7	10 31.9	-0.6002	0.5178	0.2032	+11	-
35 B. Arietis	51.2	23 46.7	10 21.9	-0.4419	0.5192	0.1988	+10	-
47 B. Arietis	38.0	1 48.9	8 23.4	+0.2014	0.5200	0.1959	+54	-
20 H <sup>1</sup> Arietis	50.0	2 37.5	7 36.3	+1.2360	0.5204	0.1948	+90	-
15 Arietis	6.5	3 13.6	7 1.3	-1.1408	0.5206	+0.1939	-25	-
6 Arietis	31.0	6 57.8	3 24.0	-0.8761	0.5222	0.1883	-6	-
26 Arietis	29.2	13 8.5	2 35.3	+0.2908	0.5248	0.1787	+60	-
7 Arietis	36.1	17 7.8	6 27.1	-1.3373	0.5267	0.1721	-59	-
$\mu$ Arietis	39.5	18 52.9	8 8.9	+1.1020	0.5274	0.1692	+90	-
8 Arietis (mean)	0.5	3 1.3	7 58.1	+0.9346	0.5310	+0.1548	+90	-
64 Arietis	25.8	14 55.7	3 33.3	-1.1339	0.5360	0.1321	-26	-
1 Arietis	31.1	16 54.4	5 28.2	+1.2373	0.5368	0.1281	+85	-
7 Tauri	11.2	19 42.1	8 10.3	-0.2573	0.5378	0.1224	+25	-
11 Tauri	3.7	22 38.9	11 1.3	-0.8741	0.5389	0.1163	-8	-
16 Tauri	1.7	0 32.7	11 8.5	+0.4856	0.5396	+0.1123	+75	-
17 Tauri	51.2	0 34.8	11 6.5	+0.6844	0.5396	0.1122	+90	-
18 Tauri	34.8	0 42.2	10 59.4	-0.1062	0.5397	0.1120	+37	-
9 Tauri	12.5	0 43.8	10 57.8	+0.3086	0.5397	0.1119	+62	-
20 Tauri	6.5	1 1.2	10 41.0	+0.4501	0.5398	0.1113	+72	-
21 Tauri	17.8	1 3.3	10 38.9	+0.2470	0.5398	+0.1112	+58	-
22 Tauri	16.2	1 7.2	10 35.2	+0.2835	0.5398	0.1111	+60	-
23 Tauri	41.4	1 15.5	10 27.2	+0.9402	0.5399	0.1108	+90	-
7 Tauri	51.0	1 47.7	9 56.0	+0.8237	0.5401	0.1097	+90	-
27 Tauri	48.0	2 34.6	9 10.7	+0.9628	0.5403	0.1080	+90	-
28 Tauri	53.0	2 35.2	9 10.1	+0.8714	0.5403	+0.1080	+90	-
14 H. Tauri	19.8	3 5.2	8 41.1	-0.6762	0.5405	0.1069	+5	-
$\rho$ Tauri	15.9	12 33.0	0 27.8	-0.7997	0.5434	-	-3	-
1 Tauri	26.1	17 56.7	5 40.6	+0.5538	0.5448	0.0739	+82	-
17 B. Aurigæ	45.6	7 38.5	5 5.4	-1.2340	0.5473	0.0419	-45	-
38 B. Aurigæ	34.9	13 0.4	0 5.5	-0.8455	0.5478	+0.0291	-7	-
47 B. Aurigæ	55.7	15 18.7	2 19.1	-1.1693	0.5479	0.0236	-30	-
354 B. Tauri	52.5	20 23.5	7 13.5	-1.0222	0.5481	+0.0114	-21	-
107 B. Aurigæ	36.6	3 8.7	10 15.1	-0.7057	0.5479	0.0049	+2	-
112 B. Aurigæ	52.5	3 42.5	9 42.4	+0.1090	0.5478	0.0062	+45	-
125 Tauri	5 51.2	4 53.9	8 33.5	+1.2359	0.5477	0.0092	+80	-

## ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

NOVEMBER.

CONJUNCTION IN R. A.				Limiting Parallels.	
Hour angle, $H$	$Y$	$x'$	$y'$	N.	S.
h m				°	°
3 41.1	-1.1671	0.5472	-0.0212	-35	-62
2 38.8	-0.8016	0.5471	0.0238	-4	-62
0 34.3	+0.9751	0.5468	0.0289	+90	+37
0 43.2	-0.8715	0.5465	0.0321	-9	-62
4 16.2	+0.6615	0.5417	0.0775	+90	+13
0 49.1	-0.0734	0.5400	-0.0892	+39	-27
2 22.7	-1.0083	0.5394	0.0927	-18	-64
2 40.6	-0.8560	0.5393	0.0934	-7	-64
4 2.1	+0.8886	0.5388	0.0964	+90	+24
8 34.3	+0.4857	0.5370	0.1064	+75	+1
9 34.9	-0.4709	0.5366	-0.1086	+17	-51
0 24.9	-1.1380	0.5350	0.1171	-29	-65
0 23.0	+1.1898	0.5350	0.1172	+90	+45
6 4.9	+0.6924	0.5332	0.1262	+90	+10
3 37.1	-1.2741	0.5321	0.1312	-47	-65
3 10.3	-1.1848	0.5319	-0.1321	-33	-66
2 19.8	+0.0262	0.5316	0.1338	+44	-26
1 12.6	+0.5507	0.5311	0.1360	+80	+1
1 11.4	-0.6228	0.5300	0.1407	+8	-63
0 13.7	-0.3336	0.5260	0.1577	+24	-48
7 46.9	-0.4462	0.5234	-0.1684	+19	-56
6 5.4	+1.1460	0.5233	0.1714	+90	+34
1 50.5	-1.1927	0.5209	0.1784	-31	-69
1 52.3	-1.0521	0.5194	0.1843	-18	-70
1 54.9	-0.9230	0.5193	0.1844	-9	-70
3 59.3	+0.1915	0.5185	-0.1876	+54	-24
6 56.2	-1.1335	0.5174	0.1921	-24	-71
9 13.3	+0.1558	0.5165	0.1955	+52	-27
6 23.5	+0.8334	0.5136	0.2073	+90	+7
4 57.5	+0.5737	0.5132	0.2092	+80	-7
1 58.0	-0.5537	0.5123	-0.2130	+14	-58
5 21.4	-1.1347	0.5103	0.2218	-23	-75
6 25.9	-1.3507	0.5101	0.2231	-47	-73
0 39.9	+0.4072	0.5092	0.2278	+67	-18
1 11.7	+0.5425	0.5091	0.2283	+77	-11
1 15.4	+0.6772	0.5091	-0.2284	+90	-4
2 26.3	-0.2827	0.5076	0.2385	+28	-56
6 22.1	-1.1915	0.5072	0.2458	-26	-81
1 13.8	-0.4774	0.5073	0.2493	+18	-70
8 25.8	+0.7432	0.5077	0.2521	+90	-3
7 2.9	-1.3470	0.5078	-0.2529	-42	-82
0 16.3	-0.3502	0.5090	0.2567	+25	-62
3 29.2	+0.5481	0.5097	0.2581	+77	-15
8 40.1	-0.8986	0.5110	0.2600	-5	-88
9 29.2	-0.7370	0.5113	0.2602	+5	-88
1 40.6	+0.2711	0.5120	-0.2608	+58	-29
1 57.7	-1.1660	0.5121	0.2609	-23	-88
5 34.1	-0.5511	0.5146	0.2621	+14	-77
4 50.9	+0.9386	0.5149	-0.2622	+88	+6

DECEMBER

B. Virginis	6.5	+2.09	-18.5	-5 15.1	1 8 0.0	-11 30.8	-0.3453	0.5242	-0.2609	+25	-62
Virginis	5.3	2.90	17.9	8 59.3	17 26.0	-2 22.6	+1.0489	0.5305	0.2574	+81	+15
Virginis	4.8	2.88	18.5	7 32.0	20 2.4	+0 8.7	-1.1105	0.5326	0.2561	-20	-90
B. Virginis	6.0	+2.83	-17.7	-11 11.6	2 3 6.3	+6 58.7	+0.8317	0.5383	-0.2517	+79	+1

[Eph 13]

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
DECEMBER.

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## ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.

DECEMBER.

FUNCTION IN R. A.				Limiting Parallels.	
	$Y$	$x'$	$y$	N.	S.
m				.	.
4	-0.2683	0.5170	+0.1960	+28	-50
5	+0.3710	0.5178	0.1932	+65	-16
0	-0.9747	0.5184	0.1911	-13	-71
1	-0.7178	0.5190	0.1855	+4	-70
0	+0.4370	0.5226	0.1759	+70	-10
0	-1.2012	0.5244	+0.1694	-33	-68
7	+1.2370	0.5252	0.1664	+89	+44
4	+1.0522	0.5280	0.1521	+90	+29
2	-1.0447	0.5341	0.1295	-20	-65
7	-0.1771	0.5361	0.1199	+33	-36
9	-0.8010	0.5373	+0.1139	-3	-65
4	+0.5565	0.5380	0.1099	+81	+4
11	+0.7556	0.5380	0.1098	+90	+15
3	-0.0364	0.5381	0.1096	+41	-27
7	+0.3788	0.5381	0.1095	+67	-6
8	+0.5199	0.5382	+0.1089	+78	+2
7	+0.3164	0.5382	0.1088	+62	-9
9	+0.3529	0.5383	0.1087	+65	-7
9	+1.0101	0.5383	0.1084	+90	+31
6	+0.8923	0.5385	0.1072	+90	+23
2	+1.0299	0.5388	+0.1056	+90	+33
6	+0.9383	0.5388	0.1056	+90	+26
4	-0.6122	0.5390	0.1045	+8	-60
4	-0.7560	0.5423	0.0839	-1	-64
9	+0.5876	0.5440	0.0717	+85	+9
5	-1.2303	0.5471	+0.0398	-45	-62
9	-0.8523	0.5479	0.0271	-8	-62
5	-1.1809	0.5481	0.0216	-37	-62
1	-1.0440	0.5485	+0.0094	-23	-62
8	-0.7408	0.5486	-0.0069	0	-62
1	+0.0732	0.5485	-0.0082	+47	-11
3	+1.1983	0.5485	0.0111	+86	+56
9	-1.2158	0.5482	0.0232	-43	-62
11	-0.8522	0.5481	0.0257	-8	-62
4	+0.9210	0.5479	0.0309	+90	+33
8	-0.9289	0.5477	-0.0341	-13	-62
2	+0.5672	0.5435	0.0797	+83	+7
9	-0.1777	0.5418	0.0913	+33	-33
1	-1.1159	0.5413	0.0948	-28	-64
11	-0.9641	0.5412	0.0955	-15	-64
3	+0.7789	0.5407	-0.0986	+90	+17
0	+0.3672	0.5390	0.1085	+66	-6
5	-0.5919	0.5386	0.1107	+10	-58
8	-1.2669	0.5369	0.1193	-47	-65
0	+1.0626	0.5369	0.1193	+90	+34
8	+0.5572	0.5351	-0.1283	+81	+2
4	-0.1163	0.5334	0.1358	+36	-34
6	+0.4068	0.5329	0.1381	+68	-7
4	-0.7722	0.5318	0.1428	-1	-67
9	-0.4982	0.5276	0.1597	+16	-58
7	-0.6209	0.5248	-0.1702	+9	-66
1	+1.0208	0.5255	0.1717	+90	+24
3	+1.3010	0.5222	0.1793	+81	+50
5.7	-1.2439	0.5203	0.1859	-36	-70
8.3	-1.1145	0.5203	0.1860	-23	-70
53.1	+0.0003	0.5193	-0.1892	+43	-34

ELEMENTS FOR THE PREDICTION OF OCCULTATIONS.  
DECEMBER.

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[Eph 15]

OCCULTATIONS VISIBLE AT WASHINGTON DURING THE YEAR 1915.

No.	THE STAR'S		IMMERSION.				EMERSION.				Duration of Occultation.
			Washington.		Angle from—		Washington.		Angle from—		
Name.	Mag.	Sidereal Time.	Mean Time.	North Point.	Vertex.	Sidereal Time.	Mean Time.	North Point.	Vertex.		
			h m	h m	°	°	h m	h m	°	°	h m
1	A Geminorum	5.1	2 39	7 57	111	170	3 48	9 5	258	318	1 8
2	7 Cancri	5.5	12 18	17 30	75	18	13 4	18 16	342	286	0 45
8	75 Virginis	5.6	12 32	17 20	161	175	13 35	18 23	273	271	1 3
11	7 Scorpii	2.9	14 36	19 12	167	190	15 13	19 49	226	242	0 37
19	13 Piscium	6.4	1 39	5 46	87	53	2 40	6 47	198	156	1 1
23	26 Arietis	6.2	0 33	4 25	33	79	1 51	5 42	260	281	1 17
24	7 Tauri	5.9	10 13	13 59	16	325	10 34	14 19	334	285	0 20
27	415 B. Tauri	6.1	0 44	4 19	67	126	1 48	5 23	277	338	1 4
28	39 Geminorum	6.2	1 38	5 10	109	167	2 42	6 13	252	312	1 3
28	40 Geminorum	6.3	2 20	5 52	164	223	2 40	6 12	198	258	0 20
29	9 Cancri	6.2	8 56	12 23	90	56	10 6	13 33	326	273	1 10
31	7 Leonis	5.6	4 1	7 20	75	128	4 52	8 11	328	22	0 51
2	79 Leonis	5.5	4 50	8 2	113	164	5 46	8 57	302	353	0 55
2	ν Leonis	4.5	13 20	16 30	98	68	14 22	17 32	336	296	1 2
9	58 G. Sagittarii	6.1	14 17	17 0	103	146	15 27	18 9	264	296	1 9
23	136 Tauri	4.6	10 42	12 30	76	17	11 37	13 25	307	252	0 55
25	176 B. Geminorum	6.3	7 3	8 44	121	144	8 29	10 10	282	244	1 26
25	181 B. Geminorum	6.0	7 48	9 29	132	121	9 10	10 50	274	224	1 21
25	82 Geminorum	6.3	13 25	15 5	152	97	14 8	15 47	252	200	0 42
26	7 Cancri	5.5	7 34	9 10	164	194	8 31	10 8	249	247	0 57
26	102 B. Cancri	6.5	12 13	13 48	105	49	13 14	14 50	314	258	1 1
26	2 Cancri	6.3	12 22	13 58	127	71	13 24	15 0	292	236	1 2
4	83 Virginis	5.6	7 53	9 6	136	188	8 45	9 58	283	332	0 52
20	18 Tauri	5.6	10 43	10 53	49	0	11 26	11 36	303	258	0 43
20	9 Tauri	4.3	10 52	11 2	152	104	11 14	11 23	199	154	0 21
20	21 Tauri	5.8	11 0	11 9	123	75	11 42	11 51	229	186	0 42
25	9 Cancri	6.2	6 10	6 0	100	151	7 36	7 26	302	321	1 26
25	49 B. Cancri	6.0	15 0	14 49	157	107	15 36	15 25	247	200	0 36
28	37 Sextantis	6.3	9 52	9 31	209	226	10 7	9 45	230	243	0 14
29	ν Leonis	4.5	10 10	9 44	164	188	11 11	10 45	275	282	1 1
31	75 Virginis	5.6	15 28	14 53	98	71	16 34	16 0	320	282	1 7
21	82 Geminorum	6.3	9 38	7 42	157	106	10 39	8 43	256	198	1 1
22	102 B. Cancri	6.5	9 10	7 10	100	79	10 26	8 26	324	278	1 16
22	2 Cancri	6.3	9 20	7 20	121	96	10 42	8 41	302	253	1 21
30	π Scorpii	3.0	10 56	8 24	102	151	11 53	9 21	301	344	0 57
5	2 Capricorni	4.3	17 21	14 29	50	94	18 33	15 40	263	297	1 11
6	2 Aquarii	5.4	16 50	13 53	62	112	17 56	15 0	249	294	1 6
18	187 B. Geminorum	6.3	14 55	11 12	129	82	15 42	11 59	267	224	0 46
21	A Leonis	4.6	14 32	10 38	97	44	15 27	11 32	326	273	0 54
25	75 Virginis	5.6	16 44	12 33	60	22	17 23	13 12	348	305	0 39
29	10 G. Sagittarii	5.7	19 11	14 44	22	5	19 48	15 21	322	298	0 37
e 1	20 Capricorni	6.2	16 27	11 49	112	158	17 20	12 42	210	250	0 53
2	μ Capricorni	5.2	17 18	12 36	120	167	17 58	13 16	190	233	0 40
4	13 Piscium	6.4	20 23	15 32	94	136	21 21	16 30	189	222	0 58
19	359 B. Leonis	6.3	12 44	6 55	153	128	13 54	8 6	285	246	1 10
25	43 Ophiuchi	5.4	20 17	14 3	38	4	21 4	14 50	308	267	0 47
27	51 Sagittarii	5.8	19 34	13 13	32	31	20 36	14 15	286	273	1 2
27	h Sagittarii	4.7	19 38	13 17	77	76	20 54	14 33	238	221	1 16
2	25 Piscium	6.2	17 2	10 22	36	87	17 52	11 12	270	322	0 50
23	10 G. Sagittarii	5.7	19 11	11 8	16	0	19 43	11 40	327	304	0 32
26	URANUS	6.0	23 43	15 28	42	10	0 47	16 31	252	210	1 4
28	252 B. Aquarii	5.8	23 49	15 26	47	31	1 5	16 41	234	202	1 16

NOTE.—The angles of position are counted from the north point and vertex of the Moon's limb toward the east.

† Immersion below the horizon of Washington.

‡ Emersion below the horizon of Washington.



OCCULTATIONS VISIBLE AT WASHINGTON DURING THE YEAR 1915.

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EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE SUN.  
FOR WASHINGTON MEAN NOON.

Date.	<i>P</i>	<i>B</i> <sub>0</sub>	<i>L</i> <sub>0</sub>	Date.	<i>P</i>	<i>B</i> <sub>0</sub>	<i>L</i> <sub>0</sub>
	°	°	°		°	°	°
Jan. 1	+ 2.14	-3.13	88.24	July 5	- 1.01	+3.40	166.47
6	- 0.30	3.70	22.39	10	+ 1.26	3.92	100.29
11	2.72	4.24	316.55	15	3.51	4.41	34.13
16	5.09	4.74	250.72	20	5.72	4.87	327.97
21	7.40	5.21	184.88	25	7.87	5.30	261.82
26	- 9.63	-5.64	119.05	30	+ 9.95	+5.70	195.68
31	11.76	6.02	53.22	Aug. 4	11.95	6.05	129.56
Feb. 5	13.78	6.35	347.38	9	13.85	6.36	63.45
10	15.68	6.64	281.55	14	15.65	6.63	357.35
15	17.44	6.87	215.71	19	17.33	6.85	291.26
20	-19.06	-7.05	149.87	24	+18.89	+7.03	225.19
25	20.54	7.17	84.02	29	20.32	7.15	159.13
Mar. 2	21.86	7.24	18.16	Sept. 3	21.62	7.23	93.08
7	23.02	7.25	32.28	8	22.78	7.25	27.05
12	24.02	7.20	246.39	13	23.79	7.22	321.03
17	-24.85	-7.10	180.49	18	+24.64	+7.14	255.02
22	25.51	6.95	114.58	23	25.34	7.01	189.02
27	25.99	6.75	48.64	28	25.87	6.82	123.03
Apr. 1	26.30	6.50	342.68	Oct. 3	26.23	6.58	57.06
6	26.43	6.20	276.70	8	26.41	6.29	351.09
11	-26.37	-5.85	210.71	13	+26.41	+5.96	285.13
16	26.13	5.46	144.69	18	26.22	5.58	219.18
21	25.71	5.03	78.66	23	25.84	5.15	153.23
26	25.11	4.57	12.60	28	25.27	4.69	87.29
May 1	24.32	4.08	306.52	Nov. 2	24.50	4.19	21.36
6	-23.35	-3.56	240.43	7	+23.54	+3.66	315.44
11	22.20	3.02	174.32	12	22.38	3.10	249.52
16	20.88	2.45	108.19	17	21.02	2.51	183.61
21	19.40	1.87	42.05	22	19.48	1.90	117.70
26	17.77	1.28	335.90	27	17.76	1.28	51.80
31	-15.99	0.68	269.73	Dec. 2	+15.88	0.65	345.90
June 5	14.09	-0.08	203.56	7	13.85	+0.01	280.02
10	12.08	+0.52	137.38	12	11.70	-0.63	214.14
15	9.97	1.12	71.20	17	9.44	1.27	148.26
20	7.79	1.71	5.02	22	7.09	1.90	82.39
25	- 5.56	+2.29	298.83	27	+ 4.69	-2.51	16.53
30	- 3.29	+2.85	232.65	32	+ 2.26	-3.10	310.68

In the above table, *P* is the position-angle of the axis of rotation measured eastward from the north point of the disk, while *L*<sub>0</sub> and *B*<sub>0</sub> are the heliographic longitudes and latitudes, respectively, of the center of the disk. The longitudes are reckoned from the Solar Meridian which passed through the ascending node of the Sun's equator on the ecliptic, on Jan. 1, 1854, Greenwich Mean Noon.

FOR WASHINGTON MEAN MIDNIGHT.

Date.		The Earth's Selenographic—		Physical Libration.		The Sun's Selenographic—		C
		Long.	Lat.	Long.	Lat.	Colong.	Lat.	
		°	°	°	°	°	°	°
Jan.	1	−4.44	−4.22	−0.01	−0.04	102.58	−1.19	7.00
	2	4.89	2.97	0.01	0.04	114.71	1.16	11.63
	3	5.17	1.55	0.01	0.04	126.84	1.13	15.54
	4	5.26	−0.03	0.01	0.04	138.97	1.10	18.59
	5	5.16	+1.52	0.01	0.04	151.11	1.07	20.74
	6	−4.85	+3.00	−0.01	−0.04	163.25	−1.04	21.96
	7	4.29	4.34	−0.01	0.04	175.40	1.01	22.17
	8	3.48	5.44	0.00	0.04	187.56	0.98	21.27
	9	2.44	6.22	0.00	0.04	199.72	0.95	19.14
	10	−1.19	6.63	0.00	0.04	211.89	0.92	15.66
	11	+0.21	+6.61	0.00	−0.04	224.07	−0.89	10.87
	12	1.64	6.16	0.00	0.04	236.25	0.87	5.11
	13	3.00	5.32	0.00	0.04	248.44	0.84	358.94
	14	4.18	4.15	0.00	0.04	260.63	0.82	353.06
	15	5.07	2.74	0.00	0.04	272.82	0.80	347.97
	16	+5.61	+1.19	0.00	−0.04	285.01	−0.78	343.94
	17	5.77	−0.38	0.00	0.04	297.20	0.76	340.97
	18	5.55	1.90	0.00	0.04	309.38	0.74	339.01
	19	4.98	3.28	0.00	0.04	321.56	0.73	337.98
	20	4.12	4.47	0.00	0.04	333.74	0.71	337.81
	21	+3.05	−5.45	−0.01	−0.04	345.91	−0.70	338.49
	22	1.83	6.18	0.01	0.04	358.07	0.68	340.04
	23	+0.55	6.64	0.01	0.04	10.23	0.67	342.48
	24	−0.71	6.81	0.01	0.04	22.38	0.65	345.82
	25	1.90	6.70	0.01	0.04	34.53	0.63	349.99
	26	−2.94	−6.29	−0.01	−0.04	46.67	−0.61	354.84
	27	3.79	5.58	0.01	0.04	58.81	0.59	0.07
	28	4.42	4.60	0.01	0.04	70.94	0.56	5.30
	29	4.80	3.37	0.01	0.04	83.07	0.53	10.18
	30	4.94	1.94	0.01	0.04	95.20	0.50	14.40
Feb.	31	−4.84	−0.38	−0.01	−0.04	107.33	−0.46	17.79
	1	4.51	+1.22	0.01	0.04	119.47	0.43	20.76
	2	3.97	2.78	0.01	0.04	131.60	0.39	21.76
	3	3.26	4.19	0.01	0.04	143.74	0.35	22.24
	4	2.40	5.36	0.01	0.04	155.89	0.31	21.61
	5	−1.43	+6.21	−0.01	−0.04	168.04	−0.28	19.78
	6	−0.39	6.68	0.01	0.04	180.20	0.24	16.65
	7	+0.67	6.75	0.01	0.04	192.37	0.20	12.27
	8	1.71	6.40	0.01	0.04	204.54	0.17	6.86
	9	2.68	5.67	0.01	0.04	216.72	0.14	0.91
	10	+3.52	+4.59	−0.01	−0.04	228.91	−0.11	355.03
	11	4.19	3.26	0.01	0.04	241.10	0.08	349.74
	12	4.64	1.76	0.01	0.04	253.30	0.05	345.36
	13	4.83	+0.18	0.01	0.04	265.50	−0.02	342.01
	14	4.75	−1.38	0.01	0.04	277.69	0.00	339.66
	15	+4.39	−2.84	−0.01	−0.04	289.89	+0.03	338.26
	16	+3.77	−4.13	−0.01	−0.04	302.09	+0.05	337.75

EPHEMERIS FOR  
FOR

OBSERVATIONS OF THE MOON.  
MEAN

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE MOON.  
FOR WASHINGTON MEAN MIDNIGHT.

Date.		The Earth's Selenographic—		Physical Libration.		The Sun's Selenographic—		C
		Long.	Lat.	Long.	Lat.	Colong.	Lat.	
		.	.	.	.	.	.	.
Apr.	1	−0.34	+6.36	−0.02	−0.04	117.79	+1.10	18.72
	2	+1.45	6.62	0.02	0.04	129.95	1.13	14.84
	3	3.07	6.44	0.02	0.04	142.12	1.15	9.73
	4	4.40	5.85	0.02	0.04	154.29	1.18	3.84
	5	5.39	4.90	0.02	0.04	166.47	1.20	357.82
	6	+6.00	+3.69	−0.01	−0.04	178.66	+1.22	352.24
	7	6.26	2.30	0.01	0.04	190.86	1.24	347.48
	8	6.21	+0.81	0.01	0.04	203.06	1.26	343.68
	9	5.88	−0.69	0.01	0.04	215.27	1.28	340.86
	10	5.34	2.13	0.01	0.04	227.49	1.30	338.95
	11	+4.62	−3.44	−0.01	−0.04	239.71	+1.32	337.91
	12	3.76	4.57	0.01	0.04	251.94	1.34	337.73
	13	2.77	5.48	0.01	0.04	264.16	1.36	338.41
	14	1.69	6.14	0.01	0.04	276.39	1.37	339.99
	15	+0.51	6.52	0.01	0.04	288.62	1.38	342.48
	16	−0.73	−6.62	−0.02	−0.04	300.84	+1.39	345.85
	17	2.02	6.43	0.02	0.04	313.07	1.39	350.02
	18	3.32	5.97	0.02	0.04	325.29	1.40	354.77
	19	4.58	5.25	0.02	0.04	337.50	1.40	359.83
	20	5.73	4.29	0.02	0.04	349.71	1.41	4.87
	21	−6.70	−3.12	−0.02	−0.04	1.92	+1.41	9.59
	22	7.41	1.78	0.02	0.04	14.12	1.41	13.75
	23	7.77	−0.31	0.02	0.04	26.31	1.42	17.21
	24	7.70	+1.22	0.02	0.04	38.49	1.43	19.85
	25	7.15	2.72	0.02	0.04	50.67	1.43	21.59
	26	−6.09	+4.11	−0.02	−0.04	62.85	+1.44	22.31
	27	4.57	5.27	0.02	0.04	75.02	1.45	21.86
	28	2.68	6.08	0.02	0.04	87.19	1.46	20.01
	29	−0.57	6.48	0.01	0.04	99.36	1.47	16.66
	30	+1.55	6.42	0.01	0.04	111.54	1.47	11.88
May	1	+3.50	+5.90	−0.01	−0.04	123.72	+1.48	6.02
	2	5.11	5.00	0.01	0.04	135.90	1.49	359.76
	3	6.29	3.80	0.01	0.04	148.08	1.50	353.81
	4	7.01	2.40	0.01	0.04	160.28	1.50	348.67
	5	7.28	+0.90	0.01	0.04	172.48	1.51	344.54
	6	+7.15	−0.60	−0.01	−0.04	184.69	+1.52	341.44
	7	6.70	2.04	0.01	0.04	196.90	1.53	339.30
	8	5.98	3.35	0.01	0.04	209.12	1.54	338.06
	9	5.08	4.48	0.01	0.04	221.35	1.55	337.67
	10	4.04	5.39	0.01	0.04	233.59	1.55	338.13
	11	+2.90	−6.05	−0.01	−0.04	245.82	+1.56	339.47
	12	1.69	6.45	0.01	0.04	258.06	1.56	341.72
	13	+0.44	6.56	0.01	0.04	270.30	1.56	344.87
	14	−0.84	6.39	0.01	0.04	282.54	1.56	348.85
	15	2.13	5.95	0.01	0.04	294.78	1.56	353.48
	16	−3.41	−5.25	−0.01	−0.04	307.02	+1.56	358.49
	17	−4.63	−4.31	−0.01	−0.04	319.25	+1.55	354



EPHEMERIS FOR  
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OBSERVATIONS OF THE MOON.  
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PHEMERIS FOR  
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OBSERVATIONS OF THE MOON.  
MEAN MIDNIGHT.

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EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE MOON.  
FOR WASHINGTON MEAN MIDNIGHT.

Date.		The Earth's Selenographic—		Physical Libration.		The Sun's Selenographic—		C
		Long.	Lat.	Long.	Lat.	Colong.	Lat.	
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Oct.	1	−3.61	−3.26	+0.02	−0.04	192.41	−1.24	5.92
	2	4.67	1.96	0.02	0.04	204.61	1.25	10.49
	3	5.48	−0.54	0.02	0.04	216.82	1.25	14.49
	4	5.96	+0.94	0.02	0.03	229.03	1.26	17.78
	5	6.04	2.41	0.02	0.03	241.25	1.27	20.28
	6	−5.70	+3.79	+0.02	−0.03	253.46	−1.27	21.89
	7	4.93	4.98	0.02	0.03	265.68	1.28	22.49
	8	3.79	5.89	0.02	0.03	277.90	1.29	21.93
	9	2.38	6.43	0.02	0.03	290.12	1.30	20.04
	10	−0.83	6.55	0.02	0.03	302.34	1.31	16.73
	11	+0.73	+6.24	+0.02	−0.03	314.55	−1.33	12.06
	12	2.17	5.53	0.02	0.03	326.76	1.35	6.39
	13	3.39	4.47	0.02	0.03	338.96	1.37	0.28
	14	4.35	3.15	0.02	0.03	351.15	1.39	354.38
	15	5.03	1.66	0.02	0.03	3.33	1.41	349.16
	16	+5.45	+0.10	+0.02	−0.03	15.51	−1.43	344.86
	17	5.64	−1.44	0.02	0.03	27.68	1.45	341.57
	18	5.62	2.88	0.02	0.03	39.84	1.47	339.26
	19	5.42	4.14	0.02	0.03	52.00	1.49	337.90
	20	5.05	5.17	0.02	0.03	64.16	1.51	337.47
	21	+4.52	−5.94	+0.02	−0.03	76.31	−1.52	338.00
	22	3.82	6.41	0.02	0.04	88.46	1.53	339.49
	23	2.96	6.57	0.02	0.04	100.61	1.54	341.97
	24	1.94	6.44	0.02	0.04	112.76	1.55	345.37
	25	+0.77	6.03	0.02	0.04	124.92	1.55	349.56
	26	−0.52	−5.35	+0.02	−0.04	137.08	−1.55	354.32
	27	1.88	4.45	0.02	0.04	149.24	1.55	359.34
	28	3.24	3.36	0.02	0.04	161.40	1.54	4.32
	29	4.53	2.11	0.02	0.03	173.57	1.54	8.98
	30	5.65	−0.76	0.02	0.03	185.75	1.53	13.12
	31	−6.52	+0.66	+0.02	−0.03	197.93	−1.53	16.62
Nov.	1	7.05	2.08	0.02	0.03	210.12	1.52	19.39
	2	7.15	3.42	0.02	0.03	222.31	1.51	21.35
	3	6.74	4.63	0.02	0.03	234.50	1.51	22.39
	4	5.83	5.61	0.02	0.03	246.70	1.50	22.36
	5	−4.45	+6.26	+0.02	−0.03	258.91	−1.50	21.06
	6	2.72	6.50	0.02	0.03	271.11	1.49	18.31
	7	−0.78	6.29	0.02	0.03	283.32	1.49	14.06
	8	+1.18	5.64	0.02	0.03	295.52	1.49	8.53
	9	2.99	4.60	0.02	0.03	307.72	1.49	2.29
	10	+4.51	+3.27	+0.02	−0.03	319.91	−1.49	356.06
	11	5.66	1.76	0.02	0.03	332.10	1.50	350.46
	12	6.43	+0.17	0.02	0.03	344.28	1.50	345.83
	13	6.82	−1.38	0.02	0.03	356.45	1.50	342.25
	14	6.88	2.83	0.02	0.03	8.62	1.51	339.69
	15	+6.66	−4.09	+0.02	−0.03	20.78	−1.52	338.10
	16	+6.22	−5.13	+0.02	−0.03	32.93	−1.52	337.45

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF THE MOON.  
FOR WASHINGTON MEAN MIDNIGHT.

620 ILLUMINATED DISK OF MERCURY, 1915.

FOR WASHINGTON MEAN NOON.

Date.	<i>k</i>	<i>i</i>	$\theta$	<i>L</i>	Stellar Mag.	Date.	<i>k</i>	<i>i</i>	$\theta$	<i>L</i>	Stellar Mag.
		°	°					°	°		
Jan. 1	0.997	6	142	25.1	-0.8	July 5	0.073	149	159	10.7	+2.1
6	0.999	4	65	26.9	0.9	10	0.162	133	167	22.2	1.5
11	0.993	10	19	30.1	0.9	15	0.279	116	172	34.0	0.0
16	0.975	18	3	35.2	0.9	20	0.423	99	177	46.0	+0.3
21	0.939	29	354	42.9	0.9	25	0.588	80	183	57.8	-0.3
26	0.868	43	347	53.3	-0.9	Aug. 30	0.758	59	190	66.7	-0.8
31	0.744	61	342	64.3	0.7	4	0.898	37	198	68.4	1.1
Feb. 5	0.553	84	337	68.2	-0.4	9	0.979	17	213	62.0	1.5
10	0.317	111	332	53.6	+0.4	14	0.998	5	299	52.0	1.6
15	0.110	141	324	23.0	1.4	19	0.982	16	4	43.0	1.2
20	0.012	168	280	2.6	+2.7	24	0.949	26	15	36.4	-0.8
25	0.043	156	183	8.5	2.2	29	0.910	35	20	32.0	0.5
Mar. 2	0.154	134	169	23.6	1.4	Sept. 3	0.869	42	22	29.5	0.3
7	0.280	116	164	32.3	0.9	8	0.826	49	24	28.3	-0.1
12	0.393	102	161	34.5	0.7	13	0.780	56	25	28.4	+0.1
17	0.488	91	158	33.8	+0.5	18	0.727	63	26	29.4	+0.1
22	0.566	82	156	32.6	0.4	23	0.665	71	26	31.5	0.2
27	0.633	75	154	31.6	0.3	28	0.586	80	27	34.4	0.3
Apr. 1	0.692	67	152	31.5	+0.1	Oct. 3	0.486	92	27	37.4	0.4
6	0.751	60	151	32.4	0.0	8	0.356	107	28	37.8	0.7
11	0.808	52	150	34.7	-0.2	13	0.199	127	30	30.1	+1.1
16	0.867	43	149	38.8	0.5	18	0.051	154	35	10.5	2.0
21	0.926	32	149	45.1	0.9	23	0.005	172	185	1.2	2.8
26	0.977	18	149	53.6	1.4	28	0.133	137	206	28.1	1.2
May 1	1.000	1	89	62.7	1.9	Nov. 2	0.369	105	208	57.0	+0.2
6	0.971	20	338	68.4	-1.6	7	0.594	79	208	62.0	-0.4
11	0.879	41	341	66.6	1.2	12	0.756	59	207	53.6	0.0
16	0.749	60	345	59.0	0.7	17	0.859	44	205	43.7	0.0
21	0.613	77	349	50.0	-0.2	22	0.920	33	202	35.9	0.7
26	0.487	91	353	42.2	+0.3	27	0.958	24	198	30.5	0.7
31	0.374	105	357	35.5	+0.7	Dec. 2	0.980	16	192	27.1	-0.7
June 5	0.273	117	0	29.3	1.1	7	0.993	10	182	25.1	0.7
10	0.180	130	4	22.2	1.5	12	0.999	4	157	24.4	0.8
15	0.099	143	9	14.0	1.9	17	0.999	4	59	24.7	0.8
20	0.038	158	19	5.9	2.5	22	0.994	9	24	26.2	0.8
25	0.008	170	62	1.3	+3.1	27	0.981	16	12	29.1	-0.8
30	0.019	164	140	3.2	+2.8	32	0.957	24	4	33.7	-0.8

NOTATION.

*k*=the ratio of the area of the illuminated portion of the apparent disk to the area of the entire apparent disk regarded as circular.  
*i*=the angle between the Sun and Earth, as seen from the planet.  
 $\theta$ =the angle which the line joining the cusps, or extremities of the illuminated portion, makes with the meridian.  
*L*=the brilliancy of the disk. The unit of *L* is the amount of light received by an eye from a circular disk with the same albedo as the planet, subtending an angular radius of one second of arc, situated at distance unity from the Sun, and illuminated by the latter as the mean disk of the planet is illuminated.  
The magnitudes of the planet have been computed from formulæ given in the Potsdam Observations, vol. 8, page 366.

FOR WASHINGTON MEAN NOON.

ate.	<i>k</i>	<i>i</i>	$\theta$	<i>L</i>	Stellar Mag.	Date.	<i>k</i>	<i>i</i>	$\theta$	<i>L</i>	Stellar Mag.
		°	°					°	°		
1	0.255	119.3	196.8	218.9	-4.4	July 5	0.946	26.8	175.9	51.3	-3.3
6	0.297	113.9	195.6	216.8	4.4	10	0.954	24.8	179.1	50.7	3.3
11	0.336	109.2	194.1	209.8	4.3	15	0.961	22.9	182.4	50.2	3.3
16	0.372	104.9	192.4	200.2	4.3	20	0.967	21.0	185.8	49.7	3.3
21	0.406	100.9	190.5	189.6	4.2	25	0.973	19.0	189.2	49.3	3.4
26	0.437	97.3	188.4	178.7	-4.2	30	0.978	17.0	192.7	48.9	-3.4
31	0.466	93.9	186.1	168.0	4.1	Aug. 4	0.983	15.1	196.3	48.6	3.4
5	0.493	90.8	183.8	157.7	4.1	9	0.987	13.2	200.0	48.3	3.4
10	0.519	87.8	181.3	148.1	4.0	14	0.990	11.3	203.9	48.1	3.4
15	0.544	85.0	178.8	139.1	4.0	19	0.993	9.4	208.2	47.9	3.4
20	0.567	82.4	176.2	130.9	-3.9	24	0.996	7.5	213.3	47.7	-3.4
25	0.589	79.8	173.7	123.3	3.9	29	0.998	5.7	220.0	47.6	3.5
2	0.610	77.3	171.2	116.4	3.8	Sept. 3	0.999	4.0	231.4	47.5	3.5
7	0.630	74.9	168.8	110.1	3.8	8	1.000	2.5	254.9	47.4	3.5
12	0.649	72.6	166.5	104.4	3.7	13	1.000	2.0	303.5	47.4	3.5
17	0.668	70.4	164.3	99.2	-3.7	18	0.999	3.0	342.6	47.4	-3.5
22	0.686	68.2	162.3	94.4	3.7	23	0.999	4.5	359.1	47.5	3.5
27	0.703	66.1	160.5	90.0	3.6	28	0.997	6.2	6.9	47.6	3.5
1	0.719	64.0	158.9	86.0	3.6	Oct. 3	0.995	7.9	11.1	47.7	3.4
6	0.735	61.9	157.5	82.4	3.5	8	0.993	9.7	13.6	47.9	3.4
11	0.751	59.9	156.4	79.0	-3.5	13	0.990	11.4	15.0	48.1	-3.4
16	0.766	57.9	155.5	75.9	3.5	18	0.987	13.1	15.6	48.3	3.4
21	0.780	55.9	154.8	73.2	3.5	23	0.983	14.9	15.6	48.6	3.4
26	0.794	53.9	154.4	70.6	3.4	28	0.979	16.6	15.1	49.0	3.4
1	0.808	52.0	154.3	68.2	3.4	Nov. 2	0.975	18.3	14.2	49.4	3.4
6	0.821	50.1	154.4	66.1	-3.4	7	0.970	20.0	13.0	49.8	-3.4
11	0.834	48.1	154.8	64.1	3.4	12	0.965	21.6	11.4	50.3	3.3
16	0.846	46.2	155.5	62.3	3.4	17	0.959	23.3	9.6	50.9	3.3
21	0.858	44.3	156.4	60.7	3.3	22	0.953	25.0	7.5	51.5	3.3
26	0.870	42.3	157.6	59.2	3.3	27	0.947	26.6	5.3	52.2	3.3
31	0.881	40.4	159.0	57.9	-3.3	Dec. 2	0.940	28.3	2.9	52.9	-3.3
5	0.892	38.5	160.7	56.6	3.3	7	0.933	30.0	0.4	53.8	3.3
10	0.902	36.5	162.7	55.5	3.3	12	0.926	31.6	357.9	54.7	3.3
15	0.912	34.6	164.9	54.5	3.3	17	0.918	33.3	355.4	55.7	3.3
20	0.921	32.7	167.3	53.6	3.3	22	0.910	35.0	353.0	56.8	3.3
25	0.930	30.7	170.0	52.8	-3.3	27	0.901	36.7	350.6	57.9	-3.4
30	0.938	28.8	172.9	52.0	-3.3	32	0.892	38.4	348.4	59.1	-3.4

NOTATION.

*k*=the ratio of the area of the illuminated portion of the apparent disk to the area of the entire apparent disk regarded as circular.

*i*=the angle between the Sun and Earth, as seen from the planet.

$\theta$ =the angle which the line joining the cusps, or extremities of the illuminated portion, makes with the meridian.

*L*=the brilliancy of the disk. The unit of *L* is the amount of light received by an eye from a circular disk with the same albedo as the planet, subtending an angular radius of one second of arc, situated at distance unity from the Sun, and illuminated by the latter as the mean disk of the planet is illuminated.

The magnitudes of the planet have been computed from formulæ given in the Potsdam Observations, vol. 8, page 366.

## EPHEMERIS FOR PHYSICAL OBSERVATIONS OF MARS.

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EPHEMERIS FOR PHYSICAL OBSERVATIONS OF MARS.  
WASHINGTON MEAN TIME.

Noon.	Light-Time.	Stellar Magni-tude.	<i>P</i>	$A_{\oplus}+180^{\circ}$	$D_{\oplus}$	$A_{\odot}-A_{\oplus}$	$D_{\odot}$	$\odot_{\delta}$
	m		.	.	.	.	.	.
Oct. 1	12.89	+1.2	348.97	206.33	+12.01	-34.52	- 3.62	351.05
3	12.77	1.1	349.65	207.42	12.40	34.68	3.21	352.06
5	12.65	1.1	350.32	208.51	12.78	34.84	2.81	353.07
7	12.53	1.1	350.99	209.59	13.15	35.00	2.40	354.08
9	12.41	1.1	351.66	210.66	13.51	35.16	2.00	355.08
11	12.29	+1.1	352.32	211.72	+13.86	-35.31	- 1.59	356.08
13	12.17	1.1	352.97	212.78	14.20	35.46	1.19	357.07
15	12.04	1.1	353.62	213.83	14.53	35.60	0.78	358.06
17	11.92	1.0	354.27	214.87	14.86	35.73	- 0.38	359.05
19	11.79	1.0	354.92	215.90	15.18	35.86	+ 0.02	0.04
21	11.66	+1.0	355.55	216.92	+15.48	-35.99	+ 0.42	1.02
23	11.53	1.0	356.17	217.93	15.77	36.11	0.82	2.00
25	11.40	1.0	356.79	218.94	16.05	36.22	1.21	2.98
27	11.27	0.9	357.40	219.94	16.32	36.32	1.61	3.96
29	11.14	0.9	358.01	220.92	16.58	36.41	2.00	4.93
31	11.01	+0.9	358.61	221.89	+16.83	-36.50	+ 2.40	5.90
Nov. 2	10.87	0.9	359.19	222.84	17.08	36.57	2.79	6.86
4	10.74	0.8	359.77	223.79	17.31	36.63	3.18	7.83
6	10.60	0.8	0.34	224.72	17.53	36.68	3.56	8.79
8	10.47	0.8	0.90	225.63	17.74	36.71	3.95	9.75
10	10.33	+0.7	1.44	226.53	+17.94	-36.73	+ 4.33	10.70
12	10.19	0.7	1.97	227.41	18.13	36.74	4.71	11.65
14	10.05	0.7	2.49	228.27	18.30	36.72	5.09	12.60
16	9.91	0.7	3.00	229.11	18.46	36.69	5.47	13.55
18	9.78	0.6	3.49	229.93	18.62	36.64	5.84	14.49
20	9.64	+0.6	3.97	230.73	+18.77	-36.57	+ 6.21	15.44
22	9.50	0.6	4.44	231.51	18.90	36.48	6.58	16.38
24	9.36	0.5	4.89	232.26	19.02	36.37	6.95	17.31
26	9.22	0.5	5.32	233.00	19.13	36.23	7.31	18.25
28	9.08	0.5	5.74	233.71	19.24	36.07	7.67	19.19
30	8.94	+0.4	6.14	234.38	+19.33	-35.88	+ 8.03	20.12
Dec. 2	8.80	0.4	6.52	235.03	19.41	35.66	8.39	21.04
4	8.66	0.4	6.88	235.65	19.48	35.41	8.75	21.97
6	8.52	0.3	7.22	236.23	19.54	35.13	9.10	22.90
8	8.38	0.3	7.54	236.78	19.58	34.82	9.45	23.82
10	8.25	+0.3	7.84	237.30	+19.62	-34.47	+ 9.79	24.74
12	8.11	0.2	8.12	237.78	19.65	34.08	10.14	25.66
14	7.98	0.2	8.38	238.22	19.66	33.65	10.48	26.58
16	7.84	0.1	8.61	238.62	19.67	33.19	10.81	27.49
18	7.71	+0.1	8.82	238.97	19.66	32.68	11.15	28.41
20	7.58	0.0	9.01	239.29	+19.65	-32.13	+11.48	29.32
22	7.46	0.0	9.17	239.56	19.62	31.54	11.81	30.22
24	7.33	0.0	9.30	239.79	19.59	30.89	12.13	31.13
26	7.21	-0.1	9.40	239.97	19.55	30.20	12.45	32.04
28	7.08	0.1	9.48	240.09	19.49	29.46	12.77	32.94
30	6.97	-0.2	9.53	240.16	+19.42	-28.67	+13.08	33.84
32	6.85	-0.2	9.54	240.18	+19.35	-27.82	+13.39	34.74

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF MARS.

W

MEAN TIME.



EPHEMERIS FOR PHYSICAL OBSERVATIONS OF JUPITER.  
WASHINGTON MEAN TIME.

Noon.		Light-Time.	Stellar Magni-tude.	P	$A_{\oplus} + 180^{\circ}$	$D_{\oplus}$	$A_{\odot} + 180^{\circ}$	$D_{\odot}$
		m		.	.	.	.	.
Jan.	1	47.34	-1.7	338.84	186.84	+0.36	194.42	+0.76
	8	47.91	1.6	338.48	188.33	0.42	195.04	0.80
	15	48.42	1.6	338.13	189.86	0.47	195.67	0.83
	22	48.86	1.6	337.79	191.45	0.53	196.30	0.86
	29	49.20	-1.6	337.45	193.07	+0.59	196.92	+0.89
Mar.	27	48.97	-1.6	335.35	206.63	+1.16	202.04	+1.15
Apr.	3	48.57	1.6	335.19	208.23	1.23	202.67	1.18
	10	48.09	1.6	335.05	209.79	1.30	203.30	1.22
	17	47.55	1.7	334.93	211.30	1.38	203.93	1.25
	24	46.94	1.7	334.83	212.75	1.45	204.56	1.28
May	1	46.28	-1.7	334.75	214.14	+1.52	205.19	+1.31
	8	45.56	1.7	334.68	215.46	1.59	205.82	1.34
	15	44.79	1.8	334.63	216.70	1.66	206.45	1.37
	22	43.98	1.8	334.60	217.86	1.73	207.09	1.40
	29	43.13	1.9	334.57	218.92	1.79	207.72	1.43
June	5	42.26	-1.9	334.55	219.86	+1.86	208.35	+1.46
	12	41.37	2.0	334.54	220.69	1.92	208.99	1.49
	19	40.47	2.0	334.54	221.39	1.97	209.62	1.52
	26	39.57	2.1	334.54	221.96	2.03	210.26	1.55
July	3	38.68	2.1	334.54	222.39	2.08	210.89	1.58
	10	37.82	-2.2	334.54	222.67	+2.12	211.52	+1.61
	17	36.99	2.2	334.54	222.78	2.16	212.16	1.64
	24	36.20	2.3	334.54	222.74	2.19	212.80	1.66
	31	35.47	2.3	334.54	222.54	2.22	213.43	1.69
Aug.	7	34.82	2.3	334.54	222.19	2.24	214.06	1.72
	14	34.24	-2.4	334.54	221.68	+2.25	214.70	+1.75
	21	33.75	2.4	334.54	221.04	2.26	215.34	1.78
	28	33.37	2.4	334.54	220.28	2.25	215.98	1.80
Sept.	4	33.10	2.5	334.55	219.44	2.24	216.61	1.83
	11	32.95	2.5	334.57	218.54	2.22	217.25	1.86
	18	32.92	-2.5	334.59	217.61	+2.20	217.89	+1.89
	25	33.01	2.5	334.62	216.68	2.16	218.53	1.91
Oct.	2	33.22	2.4	334.65	215.80	2.12	219.16	1.94
	9	33.55	2.4	334.68	214.99	2.08	219.80	1.97
	16	34.00	2.4	334.72	214.28	2.04	220.44	1.99
	23	34.54	-2.4	334.75	213.70	+2.00	221.08	+2.02
Nov.	30	35.17	2.3	334.78	213.27	1.96	221.72	2.04
	6	35.89	2.3	334.79	212.99	1.92	222.36	2.07
	13	36.67	2.2	334.80	212.88	1.89	222.99	2.09
	20	37.50	2.2	334.80	212.94	1.86	223.63	2.12
Dec.	27	38.38	-2.1	334.79	213.17	+1.84	224.27	+2.14
	4	39.28	2.1	334.77	213.56	1.83	224.91	2.17
	11	40.20	2.0	334.74	214.10	1.82	225.55	2.19
	18	41.12	2.0	334.70	214.79	1.82	226.19	2.22
	25	42.03	-1.9	334.67	215.62	1.82	226.83	2.24
	32	42.92	-1.9	334.63	216.58	+1.83	227.47	+2.26

PHEMERIS FOR PHYSICAL OBSERVATIONS OF JUPITER.

WASHINGTON MEAN TIME.

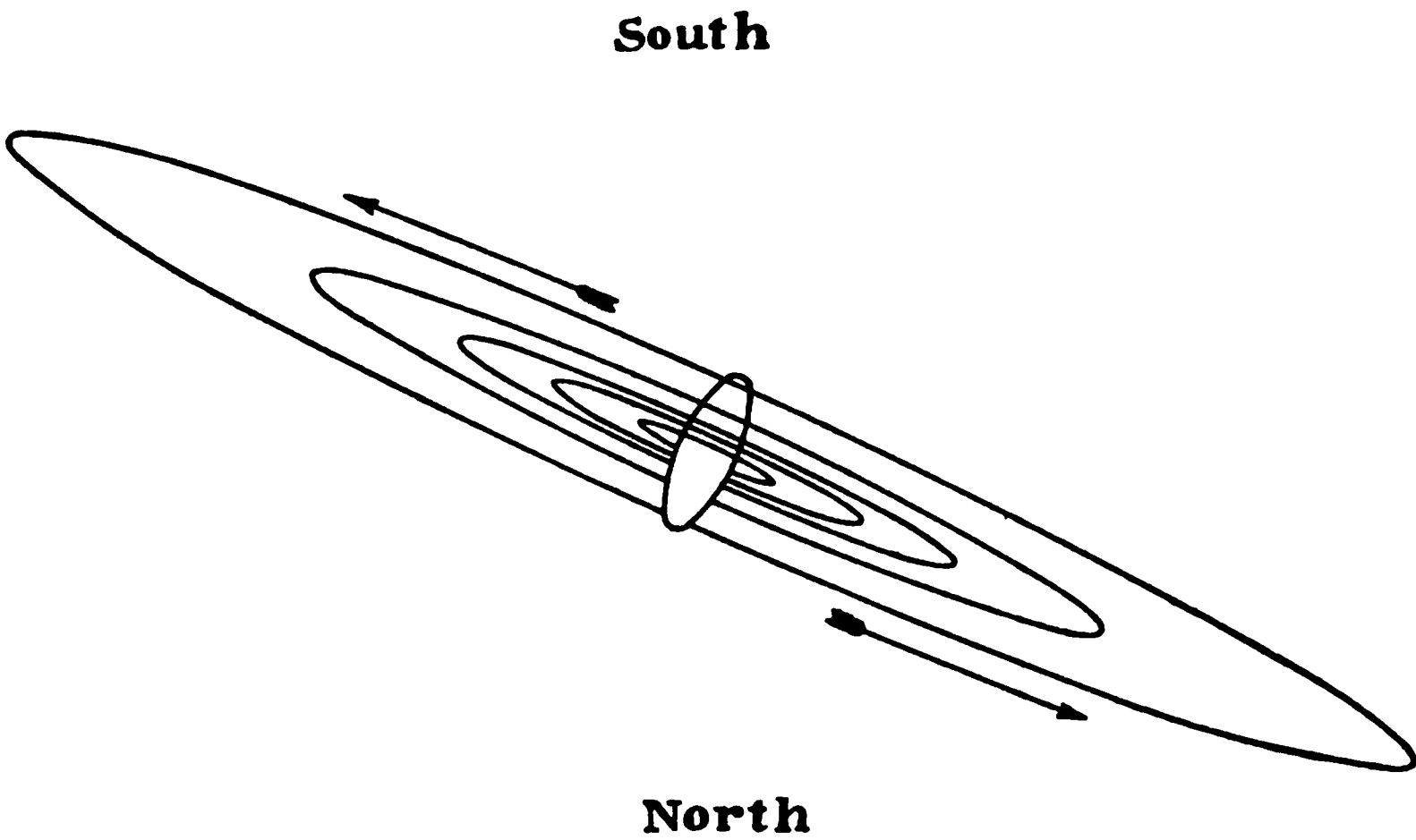
n.	Equa- torial Diameter.	Excess of Equat. Diameter over Polar.	i	q	Q	Central Meridian.		Correction for Phase.
						System I.	System II.	
	"	"	°	"	°	°	°	°
1	35.18	2.13	7.59	0.15	71.89	37.30	13.15	−0.25
8	34.75	2.11	6.73	0.12	71.77	60.76	343.21	0.20
15	34.39	2.09	5.82	0.09	71.71	84.22	313.25	0.15
22	34.09	2.07	4.86	0.06	71.74	107.66	283.30	0.10
29	33.84	2.05	3.87	0.04	71.98	131.14	253.36	−0.07
27	34.01	2.06	4.60	0.05	245.35	118.01	165.32	+0.09
3	34.29	2.08	5.56	0.08	245.61	141.96	135.86	0.14
10	34.62	2.10	6.49	0.11	245.76	165.99	106.48	0.18
17	35.02	2.12	7.37	0.14	245.86	190.11	77.18	0.24
24	35.47	2.15	8.21	0.18	245.93	214.32	47.98	0.29
1	35.98	2.18	8.96	0.22	246.00	238.63	18.89	+0.35
8	36.55	2.22	9.64	0.26	246.05	263.05	349.89	0.41
15	37.18	2.26	10.26	0.30	246.12	287.58	321.01	0.46
22	37.87	2.30	10.78	0.33	246.19	312.22	292.23	0.51
29	38.61	2.34	11.20	0.37	246.27	336.98	263.58	0.55
5	39.41	2.39	11.51	0.40	246.36	1.87	235.05	+0.58
12	40.26	2.44	11.71	0.42	246.46	26.88	206.65	0.60
19	41.15	2.49	11.78	0.43	246.56	52.03	178.38	0.61
26	42.08	2.55	11.71	0.44	246.69	77.31	150.24	0.60
3	43.05	2.61	11.50	0.43	246.83	102.72	122.24	0.58
10	44.03	2.67	11.15	0.42	247.00	128.27	94.38	+0.54
17	45.02	2.73	10.63	0.39	247.20	153.96	66.66	0.49
24	46.00	2.79	9.95	0.35	247.42	179.79	39.06	0.43
31	46.94	2.84	9.12	0.30	247.70	205.73	11.59	0.36
7	47.83	2.90	8.13	0.24	248.07	231.79	344.24	0.29
14	48.64	2.95	6.99	0.18	248.55	257.95	316.98	+0.21
21	49.33	2.99	5.72	0.12	249.26	284.18	289.80	0.14
28	49.89	3.02	4.33	0.07	250.42	310.46	262.68	0.08
4	50.30	3.05	2.86	0.03	252.76	336.77	235.57	0.04
11	50.54	3.06	1.34	0.01	260.28	3.07	208.46	+0.01
18	50.59	3.06	0.42	0.00	17.21	29.32	181.30	0.00
25	50.44	3.06	1.86	0.01	56.96	55.49	154.06	−0.02
2	50.12	3.04	3.37	0.04	61.57	81.54	126.70	0.05
9	49.63	3.01	4.81	0.09	63.37	107.45	99.20	0.10
16	48.98	2.97	6.15	0.14	64.36	133.18	71.53	0.17
23	48.21	2.92	7.37	0.20	65.03	158.73	43.67	−0.24
30	47.34	2.87	8.44	0.26	65.49	184.08	15.61	0.31
6	46.40	2.81	9.36	0.31	65.86	209.22	347.35	0.38
13	45.41	2.75	10.11	0.35	66.13	234.16	318.88	0.45
20	44.40	2.69	10.69	0.39	66.36	258.89	290.20	0.50
27	43.39	2.63	11.10	0.41	66.54	283.43	261.34	−0.54
4	42.40	2.57	11.36	0.42	66.68	307.79	232.30	0.56
11	41.43	2.51	11.45	0.41	66.81	331.99	203.09	0.57
18	40.50	2.45	11.40	0.40	66.91	356.04	173.73	0.57
25	39.63	2.40	11.21	0.38	67.01	19.95	144.24	0.55
32	38.80	2.35	10.90	0.35	67.10	43.75	114.63	−0.52

EPHEMERIS FOR PHYSICAL OBSERVATIONS OF JUPITER, SYSTEM  
WASHINGTON MEAN TIME.

Transit of Zero Meridian.				Interval between Successive Transits.		Transit of Zero Meridian.				Interval between Successive Transits.		Transit of Zero Meridian.				Interval between Successive Transits.			
d h m				h m		d h m				h m		d h m				h m			
Jan.	0	22	59.21	9	50.67	June	3	18	24.39	9	50.53	Sept.	18	9	2.34	9	50.50		
	3	0	12.57				5	19	37.05				20	10	14.41				
	5	1	25.93				7	20	49.69				22	11	26.50				
	7	2	39.29				9	22	2.31				24	12	38.61				
	9	3	52.65				11	23	14.92				26	13	50.73				
	11	5	6.02	9	50.67		14	0	27.51	9	50.52	Oct.	28	15	2.87	9	50.50		
	13	6	19.38				16	1	40.08				30	16	15.03				
	15	7	32.75				18	2	52.64				2	17	27.22				
	17	8	46.12				20	4	5.18				4	18	39.43				
	19	9	59.48				22	5	17.71				6	19	51.67				
	21	11	12.85	9	50.67		24	6	30.22	9	50.50		8	21	3.93	9	50.50		
	23	12	26.22				26	7	42.71				10	22	16.22				
	25	13	39.58				28	8	55.18				12	23	28.53				
	27	14	52.94				30	10	7.64				15	0	40.87				
	29	16	6.30				July	2	11				20.08	17	1			53.24	
Mar.	31	17	19.65	9	50.67			4	12	32.50	9	50.48		19	3	5.64	9	50.50	
	26	1	4.98					6	13	44.91				21	4	18.07			
	28	2	18.13					8	14	57.29				23	5	30.52			
Apr.	30	3	31.26	9	50.63		10	16	9.66	9	50.46		25	6	43.00	9	50.50		
	1	4	44.39				12	17	22.01				27	7	55.51				
	3	5	57.50				14	18	34.34				29	9	8.05				
	5	7	10.60				16	19	46.66				31	10	20.62				
	7	8	23.69				18	20	58.96				2	11	33.22				
	9	9	36.77	9	50.61		20	22	11.24	9	50.45	Nov.	4	12	45.84	9	50.50		
	11	10	49.83				22	23	23.51				6	13	58.49				
	13	12	2.88				25	0	35.76				8	15	11.17				
	15	13	15.92				27	1	48.00				10	16	23.88				
	17	14	28.94			Aug.	29	3	0.22				12	17	36.62				
	19	15	41.95	9	50.60		31	4	12.42	9	50.43		14	18	49.38	9	50.50		
	21	16	54.94				2	5	24.61				16	20	2.17				
	23	18	7.92				4	6	36.78				18	21	14.98				
	25	19	20.88				6	7	48.94				20	22	27.82				
May	27	20	33.83				8	9	1.09				22	23	40.69				
	29	21	46.77	9	50.59		10	10	13.22	9	50.42		25	0	53.58	9	50.50		
	1	22	59.69				12	11	25.34				27	2	6.49				
	4	0	12.60				14	12	37.44				29	3	19.43				
	6	1	25.49				16	13	49.54				1	4	32.39				
	8	2	38.37	9	50.57		18	15	1.62	9	50.41	Dec.	3	5	45.37	9	50.50		
	10	3	51.23				20	16	13.70				5	6	58.38				
	12	5	4.08				22	17	25.77				7	8	11.40				
	14	6	16.91				24	18	37.83				9	9	24.44				
	16	7	29.73			Sept.	26	19	49.88				11	10	37.50				
	18	8	42.53	9	50.56		28	21	1.93				13	11	50.58				
	20	9	55.32				30	22	13.97				15	13	3.68				
	22	11	8.09				1	23	26.01				17	14	16.80				
	24	12	20.85				4	0	38.04	9	50.41		19	15	29.94	9	50.50		
	26	13	33.59				6	1	50.08				21	16	43.09				
June	28	14	46.32				8	3	2.11				23	17	56.26				
	30	15	59.03				10	4	14.14				25	19	9.44				
	1	17	11.72	9	50.54		12	5	26.18				27	20	22.64				
							14	6	38.23	9	50.41		29	21	35.84	9	50.50		
							16	7	50.28				31	22	49.06				

S FOR PHYSICAL OBSERVATIONS OF JUPITER, SYSTEM II.

MEAN TIME.



APPARENT ORBITS OF THE SATELLITES OF JUPITER AT DATE OF OPPOSITION, SEPTEMBER 16, 1915, AS SEEN IN AN INVERTING TELESCOPE, AND ELONGATED IN THE RATIO OF THREE TO ONE IN THE DIRECTION OF THEIR MINOR AXES.

In the above diagram the central ellipse represents the disk of Jupiter, and the inner orbit is that of Satellite V.

In the diagrams of the configurations of Jupiter's four brighter satellites, pages 635-655, Jupiter is represented by a light disk, ○, in the center of the page, and the relative positions of the satellites at the Washington time stated above the diagrams are indicated by dots. The designation of each satellite is shown by a numeral placed to the right or left of the dot, according as the motion of the satellite at the instant in question is toward the east or toward the west, the motion being always toward the numeral. In constructing the diagrams the latitudes of the satellites are always considered zero, except where two or more of them chance to be at nearly the same distance from the planet, when they are placed one above the other, according to their apparent latitudes. If, at the epoch of any configuration, one or more satellites are projected on the disk of the planet, that phenomenon is indicated by a light disk, ○, at the left-hand side of the page; and if any satellites are invisible on account of being occulted behind the disk of the planet, or eclipsed by its shadow, that circumstance is indicated by a dark disk, ●, at the right-hand side of the page. In both cases the annexed numerals serve to point out which satellites are thus rendered invisible.

MEAN SYNODIC PERIODS OF THE SATELLITES.

	d	h	m	s	=	d		d	h	m	s	=	d	
I.	1	18	28	35.945	=	1.769	860	48	V.	0	11	57	27.635	= 0.498 236 52
II.	3	13	17	53.735	=	3.554	094	16	VI.				=266.00	
III.	7	3	59	35.854	=	7.166	387	20	VII.				=276.67	
IV.	16	18	5	6.928	=	16.753	552	41						

[Eph 15]

SATELLITE V.

WASHINGTON MEAN TIME OF EVERY TWENTIETH GREATEST ELONGATION.

y	d	h	E.	Oct.	d	h	E.	July	d	h	W.	Sept.	d	h	W.
	4	16.1	E.		2	7.9	E.		4	10.1	W.		22	14.8	W.
g.	14	15.2	E.		12	7.0	E.		14	9.2	W.	Oct.	2	13.9	W.
	24	14.3	E.						24	8.3	W.		12	13.0	W.
pt.	3	13.4	E.	Nov.	22	18.1	E.	Aug.	3	7.4	W.	Nov.	22	12.1	W.
	13	12.5	E.		1	17.2	E.		13	6.5	W.		1	11.2	W.
	23	11.6	E.		11	16.3	E.					Dec.	11	10.4	W.
	2	10.6	E.		21	15.5	E.		23	17.5	W.		21	9.5	W.
	12	9.7	E.	Dec.	1	14.6	E.	Sept.	2	16.6	W.		1	8.7	W.
	22	8.8	E.		11	13.8	E.		12	15.7	W.		11	7.8	W.

WASHINGTON MEAN TIME OF SUPERIOR GEOCENTRIC CONJUNCTION.

SATELLITE I.

1.	d	h	m	May	d	h	m	Aug.	d	h	m	Oct.	d	h	m
	1	17	19.5		18	2	10.0		3	22	52.6		20	18	7.1
	3	11	49.8		19	20	39.4		5	17	19.4		22	12	33.9
	5	6	20.1		21	15	8.8		7	11	46.1		24	7	0.7
	7	0	50.4		23	9	38.2		9	6	12.8		26	1	27.6
	8	19	20.7		25	4	7.5		11	0	39.4		27	19	54.6
	10	13	51.0		26	22	36.8		12	19	5.9		29	14	21.6
	12	8	21.4		28	17	6.0		14	13	32.3		31	8	48.8
	14	2	51.8	June	30	11	35.2		16	7	58.8	Nov.	2	3	16.0
	15	21	22.2		1	6	4.3		18	2	25.2		3	21	43.3
	17	15	52.6		3	0	33.4		19	20	51.5		5	16	10.6
	19	10	23.0		4	19	2.4		21	15	17.8		7	10	38.0
	21	4	53.4		6	13	31.4		23	9	44.0		9	5	5.5
	22	23	23.9		8	8	0.3		25	4	10.2		10	23	33.1
					10	2	29.2		26	22	36.4		12	18	0.8
					11	20	58.0		28	17	2.5		14	12	28.6
r.	27	17	41.2		13	15	26.7		30	11	28.6		16	6	56.4
	29	12	11.5		15	9	55.3		1	5	54.6		18	1	24.3
r.	31	6	41.8		17	4	24.0	Sept.	3	0	20.6		19	19	52.2
	2	1	12.1		18	22	52.6		4	18	46.6		21	14	20.3
	3	19	42.4		20	17	21.1		6	13	12.6		23	8	48.4
	5	14	12.6		22	11	49.5		8	7	38.6		25	3	16.6
	7	8	42.8		24	6	17.9		10	2	4.6		26	21	44.9
	9	3	13.0		26	0	46.2		11	20	30.6		28	16	13.3
	10	21	43.2		27	19	14.5		13	14	56.6		30	10	41.7
	12	16	13.3		29	13	42.7		15	9	22.5	Dec.	2	5	10.2
	14	10	43.4	July	1	8	10.9		17	3	48.4		3	23	38.8
	16	5	13.5		3	2	39.0		18	22	14.4		5	18	7.4
	17	23	43.6		4	21	7.0		20	16	40.4		7	12	36.1
	19	18	13.6		6	15	34.9		22	11	6.4		9	7	4.9
	21	12	43.7		8	10	2.8		24	5	32.4		11	1	33.8
	23	7	13.7		10	4	30.6		25	23	58.4		12	20	2.7
	25	1	43.6		11	22	58.3		27	18	24.4		14	14	31.6
	26	20	13.5		13	17	25.9		29	12	50.5		16	9	0.6
	28	14	43.4		15	11	53.5	Oct.	1	7	16.6		18	3	29.7
	30	9	13.2		17	6	21.1		3	1	42.8		19	21	58.9
y	2	3	43.1		19	0	48.6		4	20	9.0		21	16	28.1
	3	22	12.9		20	19	16.0		6	14	35.2		23	10	57.4
	5	16	42.7		22	13	43.3		8	9	1.5		25	5	26.7
	7	11	12.4		24	8	10.5		10	3	27.8		26	23	56.1
	9	5	42.1		26	2	37.7		11	21	54.2		28	18	25.6
	11	0	11.7		27	21	4.8		13	16	20.7		30	12	55.1
	12	18	41.3		29	15	31.9		15	10	47.2				
	14	13	10.9	Aug.	31	9	58.9		17	5	13.8				
	16	7	40.5		2	4	25.8		18	23	40.4				

SATELLITE II.

	d	h	m		d	h	m		d	h	m		d	h	m
Jan.	3	11	50.8	May	18	17	45.4	Aug.	4	21	33.6	Oct.	21	22	24.0
	7	1	15.9		22	7	6.2		8	10	43.2		25	11	34.3
	10	14	42.2		25	20	26.8		11	23	52.5		29	0	44.9
	14	4	7.7		29	9	46.9		15	13	1.3	Nov.	1	13	56.4
	17	17	34.3	June	1	23	6.4		19	2	9.7		5	3	8.1
	21	7	0.0		5	12	25.6		22	15	17.7		8	16	20.9
					9	1	44.3		26	4	25.4		12	5	33.8
Mar.	29	22	18.7		12	15	2.6		29	17	32.7		15	18	47.9
Apr.	2	11	43.6		16	4	20.4	Sept.	2	6	39.8		19	8	2.3
					19	17	37.7		5	19	46.7		22	21	17.8
	6	1	8.6		23	6	54.5		9	8	53.4		26	10	33.4
	9	14	33.1		26	20	10.7		12	21	59.9		29	23	50.1
	13	3	57.7		30	9	26.4		16	11	6.3	Dec.	3	13	7.0
	16	17	21.6	July	3	22	41.7		20	0	12.9		7	2	25.0
	20	6	45.7		7	11	56.3		23	13	19.6		10	15	43.1
	23	20	9.1		11	1	10.5		27	2	26.5		14	5	2.5
	27	9	32.6		14	14	24.0		30	15	33.6		17	18	21.7
	30	22	55.4		18	3	37.0	Oct.	4	4	41.0		21	7	42.2
May	4	12	18.2		21	16	49.4		7	17	48.7		24	21	2.5
	8	1	40.4		25	6	1.3		11	6	56.9		28	10	24.1
	11	15	2.5		28	19	12.6		14	20	5.4		31	23	45.2
	15	4	24.1	Aug.	1	8	23.4		18	9	14.5				

SATELLITE III.

	d	h	m		d	h	m		d	h	m		d	h	m
Jan.	5	7	0.4	May	14	15	29.0	Aug.	1	10	56.1	Oct.	18	23	41.9
	12	11	28.4		21	19	44.4		8	14	26.8		26	3	9.9
	19	15	57.3		28	23	57.0		15	17	53.2	Nov.	2	6	42.6
				June	5	4	6.5		22	21	15.5		9	10	20.6
					12	8	13.0		30	0	34.8		16	14	3.2
Apr.	1	13	6.9		19	12	15.2	Sept.	6	3	52.1		23	17	50.8
	8	17	35.0		26	16	13.4		13	7	8.0		30	21	43.0
	15	22	1.5	July	3	20	6.9		20	10	24.1	Dec.	8	1	40.1
	23	2	27.0		10	23	55.7		27	13	40.3		15	5	42.2
	30	6	49.9		18	3	40.5	Oct.	4	16	58.1		22	9	48.4
May	7	11	10.9		25	7	20.3		11	20	18.1		29	13	59.0

SATELLITE IV.

	d	h	m		d	h	m		d	h	m		d	h	m
Jan.	16	17	19.2	May	14	18	5.9	Aug.	6	10	44.4	Oct.	28	11	39.6
					31	13	28.5		23	1	44.1	Nov.	14	3	42.2
				June	17	8	8.5	Sept.	8	16	4.7		30	20	48.5
Apr.	11	1	45.1	July	4	1	59.0		25	6	11.7	Dec.	17	14	54.0
	27	22	8.8		20	18	51.3	Oct.	11	20	35.1				

DIFFERENTIAL COORDINATES OF SATELLITE VI.

Washington Mean Noon.	$\alpha_{VI}-\alpha_{Jup.}$	$\delta_{VI}-\delta_{Jup.}$	Washington Mean Noon.	$\alpha_{VI}-\alpha_{Jup.}$	$\delta_{VI}-\delta_{Jup.}$	Washington Mean Noon.	$\alpha_{VI}-\alpha_{Jup.}$	$\delta_{VI}-\delta_{Jup.}$
	m s	'		m s	'		m s	'
Jan. 0	+1 6	-12.7	June 26	+2 54	-7.7	Oct. 4	+1 11	+0.2
4	0 52	11.9	30	3 10	7.9	8	0 43	0.7
8	0 38	11.1	July 4	3 26	8.0	12	+0 15	1.2
12	+0 24	-10.2	8	3 41	8.1	16	-0 12	1.7
	. . .	. . .	12	3 55	8.1	20	0 38	2.2
Apr. 7	-2 27	+ 4.6	16	+4 8	-8.0	24	-1 3	+2.7
11	2 21	4.3	20	4 20	7.8	28	1 27	3.2
15	2 13	3.9	24	4 29	7.6	Nov. 1	1 49	3.7
19	2 3	3.4	28	4 37	7.3	5	2 8	4.2
23	1 52	2.9	Aug. 1	4 44	7.0	9	2 26	4.6
27	-1 39	+ 2.2	5	+4 48	-6.6	13	-2 40	+5.0
May 1	1 24	1.5	9	4 50	6.2	17	2 52	5.3
5	1 9	+ 0.7	13	4 49	5.7	21	3 1	5.5
9	0 52	- 0.1	17	4 46	5.3	25	3 8	5.6
13	0 35	1.0	21	4 41	4.8	29	3 11	5.6
17	-0 17	- 1.8	25	+4 33	-4.3	Dec. 3	-3 11	+5.5
21	+0 2	2.6	29	4 23	3.8	7	3 9	5.3
25	0 21	3.4	Sept. 2	4 10	3.3	11	3 4	5.0
29	0 41	4.2	6	3 54	2.9	15	2 56	4.6
June 2	1 0	4.9	10	3 36	2.4	19	2 46	4.1
6	+1 20	- 5.5	14	+3 16	-2.0	23	-2 35	+3.5
10	1 39	6.1	18	2 54	1.6	27	2 21	2.8
14	1 58	6.7	22	2 30	1.2	31	-2 6	+2.0
18	2 17	7.1	26	2 5	0.7			
22	+2 36	- 7.5	30	+1 38	-0.3			

DIFFERENTIAL COORDINATES OF SATELLITE VII.

Washington Mean Noon.	$\alpha_{VII}-\alpha_{Jup.}$	$\delta_{VII}-\delta_{Jup.}$	Washington Mean Noon.	$\alpha_{VII}-\alpha_{Jup.}$	$\delta_{VII}-\delta_{Jup.}$	Washington Mean Noon.	$\alpha_{VII}-\alpha_{Jup.}$	$\delta_{VII}-\delta_{Jup.}$
	m s	'		m s	'		m s	'
Jan. 0	+1 27	+28.4	June 26	-4 18	- 2.1	Oct. 4	+1 17	+29.1
4	1 36	27.8	30	4 21	- 0.6	8	1 38	28.6
8	1 44	27.1	July 4	4 24	+ 0.9	12	1 57	27.8
12	1 51	+26.3	8	4 25	2.5	16	2 15	26.7
	. . .	. . .	12	4 25	4.1	20	2 31	25.4
Apr. 7	+0 45	-12.2	16	-4 23	+ 5.8	24	+2 46	+23.8
11	0 25	13.5	20	4 20	7.6	28	2 59	22.0
15	+0 5	14.6	24	4 15	9.4	Nov. 1	3 9	19.9
19	-0 16	15.4	28	4 9	11.2	5	3 17	17.5
23	0 37	16.0	Aug. 1	4 0	13.0	9	3 22	15.0
27	-0 57	-16.4	5	-3 50	+14.8	13	+3 25	+12.3
May 1	1 18	16.5	9	3 38	16.7	17	3 24	9.4
5	1 38	16.3	13	3 23	18.4	21	3 21	6.5
9	1 57	15.9	17	3 7	20.1	25	3 14	3.6
13	2 15	15.3	21	2 49	21.6	29	3 4	+ 0.8
17	-2 33	-14.6	25	-2 30	+23.1	Dec. 3	+2 51	- 2.0
21	2 49	13.6	29	2 9	24.4	7	2 35	4.6
25	3 4	12.6	Sept. 2	1 47	25.6	11	2 17	7.0
29	3 18	11.4	6	1 24	26.7	15	1 57	9.1
June 2	3 30	10.2	10	1 1	27.6	19	1 36	11.0
6	-3 41	- 8.9	14	-0 37	+28.3	23	+1 14	-12.5
10	3 51	7.6	18	-0 13	28.9	27	0 51	13.8
14	3 59	6.3	22	+0 10	29.2	31	+0 27	-14.8
18	4 7	4.9	26	0 33	29.4			
22	-4 13	- 3.5	30	+0 56	+29.3			



WASHINGTON MEAN TIME.

ARY.

By reason of the proximity of JUPITER to the SUN the phenomena of the satellites are not given from January 24 to March 26.

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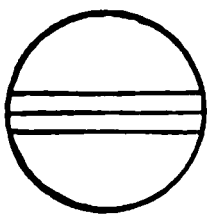
*NOTE.*—In. denotes ingress; Eg., egress; Dis., disappearance; Re., reappearance; Ec., eclipse.  
Oc. denotes occultation; Tr., transit of the satellite; Sh., transit of the shadow; \* Visible at Washington.

[Eph 13]

WASHINGTON MEAN TIME.

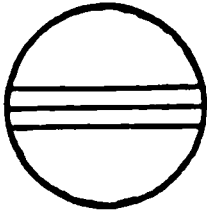
JANUARY.

Phases of the Eclipses of the Satellites for an Inverting Telescope.

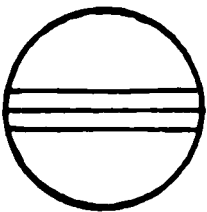


\*  
r

III.

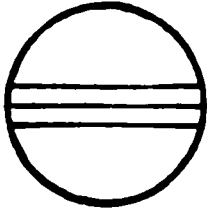


\*  
r



\*  
r

IV.



\*  
d

\*  
r

Configurations at 6<sup>h</sup> 15<sup>m</sup> for an Inverting Telescope.

West.

East.

1°



3° 2°

4°

2° 3°



1°

4°

3°

1° 2°



4°

3°



1°

2°

4°



4°

1° 3°

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3°

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2° 3°

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2°



1°

4°

[Eph 15]

WASHINGTON MEAN TIME.

MARCH.

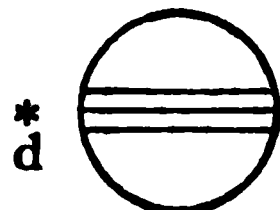
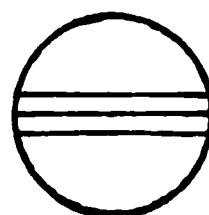
By reason of the proximity of JUPITER to the SUN the phenomena of the satellites are not given from January 24 to March 26.

d	h	m	s			d	h	m	s			d	h	m	s		
27	16	0	46	I.	Ec.	Dis.	28	18	48	III.	Sh.	In.	30	8	23	I.	Tr.
	18	51		I.	Oc.	Re.		21	8	III.	Tr.	In.		10	7	I.	Sh.
28	0	31		II.	Sh.	In.		22	16	III.	Sh.	Eg.		10	42	I.	Tr.
	1	38		II.	Tr.	In.	29	0	36	III.	Tr.	Eg.	31	4	57	I.	Ec.
	3	26		II.	Sh.	Eg.		10	29	I.	Ec.	Dis.		7	51	I.	Oc.
	4	33		II.	Tr.	Eg.		13	21	I.	Oc.	Re.		13	49	II.	Sh.
	13	19		I.	Sh.	In.		19	42	II.	Ec.	Dis.		15	3	II.	Tr.
	13	53		I.	Tr.	In.		23	46	II.	Oc.	Re.		16	44	II.	Sh.
	15	38		I.	Sh.	Eg.	30	7	48	I.	Sh.	In.		17	58	II.	Tr.
	16	12		I.	Tr.	Eg.											Eg.

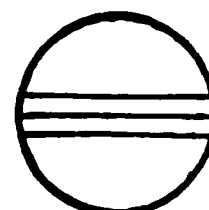
NOTE.—In. denotes ingress; Eg., egress; Dis., disappearance; Re., reappearance; Ec., eclipse.  
Oc. denotes occultation; Tr., transit of the satellite; Sh., transit of the shadow; \* Visible at Washington.

**MARCH.**

### III. No Eclipse.



#### IV. No Eclipse.



**West.**

**East.**

2°

3°

4

10

2.

1.

3.

4

3°

2

• I

4

3.

1.

2

4.

3

1

4.

WASHINGTON MEAN TIME.

**APRIL.**

d	h	m	s				d	h	m	s				d	h	m	s					
1	2	16			I.	Sh.	In.	11	5	43			II.	Sh.	In.	20	15	49			I.	Sh.
	2	54			I.	Tr.	In.		7	18			II.	Tr.	In.		16	44			I.*	Tr.
	4	35			I.	Sh.	Eg.		8	38			II.	Sh.	Eg.	21	10	40	36		I.	Ec.
	5	13			I.	Tr.	Eg.		10	12			II.	Tr.	Eg.		13	53			I.	Oc.
	8	54	4		III.	Ec.	Dis.		17	8			I.	Sh.	In.	21	37			II.	Sh.	
	14	50			III.	Oc.	Re.		17	55			I.	Tr.	In.	23	31			II.	Tr.	
	23	26	32		I.	Ec.	Dis.		19	27			I.	Sh.	Eg.	22	0	31		II.	Sh.	
2	2	22			I.	Oc.	Re.		20	14			I.	Tr.	Eg.		2	24			II.	Tr.
	8	23			IV.	Sh.	In.	12	2	50			III.	Sh.	In.		7	59			I.	Sh.
	9	0	9		II.	Ec.	Dis.		6	6			III.	Tr.	In.		8	56			I.	Tr.
	12	47			IV.	Sh.	Eg.		6	17			III.	Sh.	Eg.		10	18			I.	Sh.
	13	11			II.	Oc.	Re.		9	30			III.	Tr.	Eg.		11	14			I.	Tr.
	14	38			IV.	Tr.	In.		14	17	54		I.	Ec.	Dis.		20	57	12		III.	Ec.
	19	0			IV.	Tr.	Eg.		17	23			I.	Oc.	Re.	23	0	12	53		III.	Ec.
	20	45			I.	Sh.	In.	13	0	54	47		II.	Ec.	Dis.		0	47			III.	Oc.
	21	24			I.	Tr.	In.		5	25			II.	Oc.	Re.		4	7			III.	Oc.
	23	4			I.	Sh.	Eg.		11	36			I.	Sh.	In.		5	9	10		I.	Ec.
	23	43			I.	Tr.	Eg.		12	25			I.	Tr.	In.		8	23			I.	Oc.
3	17	55	3		I.	Ec.	Dis.		13	55			I.	Sh.	Eg.		16	48	33		II.	Ec.
	20	52			I.	Oc.	Re.		14	44			I.	Tr.	Eg.		21	36			II.	Oc.
4	3	7			II.	Sh.	In.	14	8	46	25		I.	Ec.	Dis.	24	2	27			I.	Sh.
	4	28			II.	Tr.	In.		11	53			I.	Oc.	Re.		3	26			I.	Tr.
	6	2			II.	Sh.	Eg.		19	0			II.	Sh.	In.		4	46			I.	Sh.
	7	23			II.	Tr.	Eg.		20	42			II.	Tr.	In.		5	44			I.	Tr.
	15	13			I.	Sh.	In.		21	55			II.	Sh.	Eg.		23	37	39		I.	Ec.
	15	54			I.	Tr.	In.		23	36			II.	Tr.	Eg.	25	2	53			I.	Oc.
	17	32			I.	Sh.	Eg.	15	6	5			I.	Sh.	In.		10	55			II.	Sh.
	18	13			I.	Tr.	Eg.		6	55			I.	Tr.	In.		12	55			II.	Tr.
	22	49			III.	Sh.	In.		8	24			I.	Sh.	Eg.		13	49			II.	Sh.
5	1	38			III.	Tr.	In.		9	14			I.	Tr.	Eg.		15	48			- II.	Tr.
	2	17			III.	Sh.	Eg.		16	55	46		III.	Ec.	Dis.		20	56			I.	Sh.
	5	4			III.	Tr.	Eg.		20	12	18		III.	Ec.	Re.		21	56			I.	Tr.
	12	23	40		I.	Ec.	Dis.		20	20			III.	Oc.	Dis.		23	15			I.	Sh.
	15	22			I.	Oc.	Re.		23	43			III.	Oc.	Re.	26	0	14			I.	Tr.
	22	18	34		II.	Ec.	Dis.	16	3	14	59		I.	Ec.	Dis.		10	51			III.	Sh.
6	2	36			II.	Oc.	Re.		6	23			I.	Oc.	Re.		14	16			III.	Sh.
	9	42			I.	Sh.	In.		14	12	38		II.	Ec.	Dis.		14	58			III.	Tr.
	10	25			I.	Tr.	In.		18	49			II.	Oc.	Re.		18	6	15		I.	Ec.
	12	1			I.	Sh.	Eg.	17	0	33			I.	Sh.	In.		18	17			III.	Tr.
	12	44			I.	Tr.	Eg.		1	26			I.	Tr.	In.		21	23			I.	Oc.
7	6	52	12		I.	Ec.	Dis.		2	52			I.	Sh.	Eg.	27	6	6	33		II.	Ec.
	9	52			I.	Oc.	Re.		3	44			I.	Tr.	Eg.		10	36	1		IV.	Ec.
	16	24			II.	Sh.	In.		21	43	29		I.	Ec.	Dis.		10	59			II.	Oc.
	17	53			II.	Tr.	In.	18	0	53			I.	Oc.	Re.		14	36	31		IV.	Ec.
	19	19			II.	Sh.	Eg.		8	19			II.	Sh.	In.		15	24			I.	Sh.
	20	47			II.	Tr.	Eg.		10	7			II.	Tr.	In.		16	26			I.*	Tr.
8	4	10			I.	Sh.	In.		11	13			II.	Sh.	Eg.		17	43			I.	Sh.
	4	55			I.	Tr.	In.		13	0			II.	Tr.	Eg.		18	44			I.	Tr.
	6	30			I.	Sh.	Eg.		19	2			I.	Sh.	In.		20	10			IV.	Oc.
	7	14			I.	Tr.	Eg.		19	56			I.	Tr.	In.	28	0	8			IV.	Oc.
	12	54	56		III.	Ec.	Dis.		21	21			I.	Sh.	Eg.		12	34	45		I.	Ec.
	19	17			III.	Oc.	Re.		22	14			I.	Tr.	Eg.		15	53			I.*	Oc.
9	1	20	46		I.	Ec.	Dis.		2	38			IV.	Sh.	In.	29	0	13			II.	Sh.
	4	22			I.	Oc.	Re.		6	51			III.	Sh.	In.		2	19			II.	Tr.
	11	36	30		II.	Ec.	Dis.		6	56			IV.	Sh.	Eg.		3	7			II.	Sh.
	16	0			II.	Oc.	Re.		10	17			III.	Sh.	Eg.		5	12			II.	Tr.
	22	39			I.	Sh.	In.		10	33			III.	Tr.	In.		9	53			I.	Sh.
	23	25			I.	Tr.	In.		11	24			IV.	Tr.	In.		10	55			I.	Tr.
10	0	58			I.	Sh.	Eg.		13	55			III.	Tr.	Eg.		12	12			I.	Sh.
	1	44			I.	Tr.	Eg.		15	30			IV.	Tr.	Eg.		13	14			I.	Tr.
	16	22	40		IV.	Ec.	Dis.		16	12	5		I.	Ec.	Dis.	30	0	58	2		III.	Ec.
	19	49	17		I.	Ec.	Dis.		19	23			I.	Oc.	Re.		4	12	50		III.	Ec.
	20	28	57		IV.	Ec.	Re.		3	30	46		II.	Ec.	Dis.		5	11			III.	Oc.
	22	53			I.	Oc.	Re.		8	13			II.	Oc.	Re.		7	3	19		I.	Ec.
	23	38			IV.	Oc.	Dis.		13	30			I.	Sh.	In.		8	29			III.	Oc.
11	3	52			IV.	Oc.	Re.		14	26			I.	Tr.	In.		10	22	13		I.	Oc.

**NOTE.**—In. denotes ingress; Eg., egress; Dis., disappearance; Re., reappearance; Ec., eclipse.  
Oc. denotes occultation; Tr., transit of the satellite; Sh., transit of the shadow; \* Visible at W.

[Eph 15]

WASHINGTON MEAN TIME.

APRIL.

Phases of the Eclipses of the Satellites for an Inverting Telescope.

<div><div>* d</div><div></div></div>	III.	<div><div>* d</div><div><div>* r</div><div></div></div></div>
<div><div>* d</div><div></div></div>	IV.	<div><div>* d</div><div><div>* r</div><div></div></div></div>

Configurations at 16<sup>h</sup> 45<sup>m</sup> for an Inverting Telescope.

West.				East.			
		'2	'1	○	'3	4°	
				○	1° 2	'3	
		4°		'1	○	2°	3°
	4°		2°	○	3°		
	4°		3°	'2	○	'1	
	4°	3°		1°	○	'2	
	'4	'3		○	2°	'1	
	'4	2°	'1	○			'3 ●
	'4			○	'2	1°	'3
		'1		○	2°	3°	'4 ●
		2°		○	1°	'43°	
		'23°		○		'4	'1 ●
	3°		1°	○	'2		'4
	'3			○	2°	'1	'4
	2°	1°	'3	○			4°
				○	1°	'3	4°
		'1		○	2°	'8	4°
		2°		○	1°	4°3°	
		'2	4° 3	○			'1 ●
	3°4°		1°	○	'2		
	4°	'3		○	'12°		
	4°		2°	1° 3	○		
	4°			2°	○	'1'3	
	'4		'1	○	'2	'3	
	'4			2°	○	1°	3°
		'4	'2	'1	○		
	3°			'4	○	'2	
	'3			○	'1	2°'4	
		'3	1°	○		'4	
		'2		○	1° 3	'4	

## SATELLITES OF JUPITER, 1915.

WASHINGTON MEAN TIME.

MAY.





WASHINGTON MEAN TIME.

JUNE.

d	h	m	s				d	h	m	s				d	h	m	s			
1	3	36	52		I.	Ec.	10	21	33			II.	Tr.	21	7	49			II.	Sh.
	6	55			III.	Sh.		22	39			I.	Tr.		10	40			II.	Tr.
	7	13			I.	Oc.		23	34			I.	Sh.		10	42			II.	Sh.
	10	16			III.	Sh.	11	0	56			I.	Tr.		12	6			I.	Sh.
	12	28			III.	Tr.		18	28	4		I.	Ec.		13	30			II.*	Tr.
	15	35			III.*	Tr.		22	7			I.	Oc.		13	30			I.*	Tr.
	19	2	40		II.	Ec.	12	1	2	45		III.	Ec.		14	25			I.*	Sh.
2	0	32			II.	Oc.		4	11	52		III.	Ec.		15	47			I.*	Tr.
	0	54			I.	Sh.		6	42			III.	Oc.	22	9	19	17		I.	Ec.
	2	15			I.	Tr.		9	44			III.	Oc.		12	58			I.*	Oc.
	3	12			I.	Sh.		10	54	46		II.	Ec.		18	56			III.	Sh.
	4	32			I.	Tr.		15	44			I.*	Sh.		22	14			III.	Sh.
	22	5	22		I.	Ec.		16	28			II.	Oc.	23	0	43			III.	Tr.
3	1	42			I.	Oc.		17	8			I.	Tr.		2	46	36		II.	Ec.
	13	16			II.	Sh.		18	3			I.	Sh.		3	42			III.	Tr.
	16	2			II.*	Tr.		19	25			I.	Tr.		6	35			I.	Sh.
	16	9			II.	Sh.	13	12	56	32		I.	Ec.		7	58			I.	Tr.
	18	53			II.	Tr.		16	35			I.	Oc.		8	19			II.	Oc.
	19	22			I.	Sh.	14	5	12			II.	Sh.		8	53			I.	Sh.
	20	44			I.	Tr.		8	2			II.	Tr.		10	16			I.	Tr.
	21	41			I.	Sh.		8	5			II.	Sh.	24	3	47	47		I.	Ec.
	23	1			I.	Tr.		10	13			I.	Sh.		7	26			I.	Oc.
4	16	33	56		I.	Ec.		10	53			II.	Tr.		21	7			II.	Sh.
	20	11			I.	Oc.		11	36			I.	Tr.		23	58			II.	Tr.
	21	1	21		III.	Ec.		12	31			I.	Sh.	25	0	0			II.	Sh.
5	0	11	27		III.	Ec.		13	54			I.*	Tr.		1	3			I.	Sh.
	2	34			III.	Oc.	15	7	25	7		I.	Ec.		2	27			I.	Tr.
	5	39			III.	Oc.		11	4			I.	Oc.		2	48			II.	Tr.
	8	20	3		II.	Ec.		14	56			III.*	Sh.		3	22			I.	Sh.
	13	50			I.*	Sh.		18	14			III.	Sh.		3	41			IV.	Sh.
	13	51			II.*	Oc.		20	42			III.	Tr.		4	44			I.	Tr.
	15	13			I.*	Tr.		23	43			III.	Tr.		7	33			IV.	Sh.
	16	9			I.	Sh.	16	0	12	4		II.	Ec.		17	31			IV.	Tr.
	17	30			I.	Tr.		4	41			I.	Sh.		20	8			IV.	Tr.
6	11	2	24		I.	Ec.		5	46			II.	Oc.		22	16	23		I.	Ec.
	14	40			I.*	Oc.		6	5			I.	Tr.	26	1	55			I.	Oc.
7	2	34			II.	Sh.		7	0			I.	Sh.		9	4	32		III.	Ec.
	5	23			II.	Tr.		8	22			I.	Tr.		12	11	35		III.*	Ec.
	5	28			II.	Sh.		17	17	33		IV.	Ec.		14	45			III.*	Oc.
	8	14			II.	Tr.		20	57	17		IV.	Ec.		16	3	52		II.*	Ec.
	8	19			I.	Sh.	17	1	53	37		I.	Ec.		17	42			III.	Oc.
	9	42			I.	Tr.		5	32			I.	Oc.		19	32			I.	Sh.
	10	38			I.	Sh.		6	42			IV.	Oc.		20	55			I.	Tr.
	11	59			I.	Tr.		9	35			IV.	Oc.		21	36			II.	Oc.
8	5	30	59		I.	Ec.		18	30			II.	Sh.		21	50			I.	Sh.
	9	9			I.	Oc.		21	21			II.	Tr.		23	12			I.	Tr.
	9	24			IV.	Sh.		21	23			II.	Sh.	27	16	44	51		I.	Ec.
	10	55			III.	Sh.		23	10			I.	Sh.		20	23			I.	Oc.
	13	24			IV.*	Sh.	18	0	11			II.	Tr.		10	26			II.	Sh.
	14	15			III.*	Sh.		0	33			I.	Tr.		13	16			II.*	Tr.
	16	37			III.	Tr.		1	28			I.	Sh.		13	19			II.*	Sh.
	19	41			III.	Tr.		2	50			I.	Tr.		14	0			I.*	Sh.
	21	37	25		II.	Ec.		20	22	12		I.	Ec.		15	23			I.*	Tr.
	23	0			IV.	Tr.	19	0	1			I.	Oc.		16	6			II.*	Tr.
9	2	4			IV.	Tr.		5	3	36		III.	Ec.		16	18			I.	Sh.
	2	47			I.	Sh.		8	11	42		III.	Ec.		17	40			I.	Tr.
	3	10			II.	Oc.		10	45			III.	Oc.	29	11	13	28		I.	Ec.
	4	10			I.	Tr.		13	29	21		II.*	Ec.		14	51			I.*	Oc.
	5	6			I.	Sh.		13	45			III.*	Oc.		22	57			III.	Sh.
	6	28			I.	Tr.		17	38			I.	Sh.	30	2	14			III.	Sh.
	23	59	29		I.	Ec.		19	2			I.	Tr.		4	40			III.	Tr.
10	3	38			I.	Oc.		19	3			II.	Oc.		5	31	4		II.	Ec.
	15	52			II.*	Sh.		19	56			I.	Sh.		7	36			III.	Tr.
	18	42			II.	Tr.		21	19			I.	Tr.		8	28			I.	Sh.
	18	46			II.	Sh.	20	14	50	41		I.*	Ec.		9	52			I.	Tr.
	21	16			I.	Sh.		18	29			I.	Oc.		10	47			II.	Oc.
															12	51			I.*	Tr.

NOTE.—In. denotes ingress; Eg., egress; Dis., disappearance; Re., reappearance; Ec., eclipse.  
Oc. denotes occultation; Tr., transit of the satellite; Sh., transit of the shadow; \* Visible at Wau  
[Eph 15]



WASHINGTON MEAN TIME.

JULY.

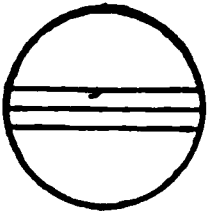
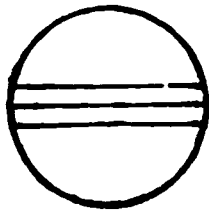
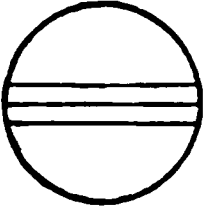
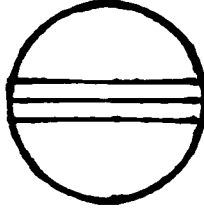
d	h	m	s				d	h	m	s				d	h	m	s				
1	5	41	59	I.	Ec.	Dis.	11	1	22			III.	Oc.	Re.	20	19	51		IV.	Oc.	Re.
	9	19		I.	Oc.	Re.		1	37			I.	Sh.	Eg.		20	24		I.	Oc.	Re.
	23	44		II.	Sh.	In.		2	35			II.	Oc.	Re.	21	11	0		III.*	Sh.	In.
2	2	32		II.	Tr.	In.		2	54			I.	Tr.	Eg.		13	4	19	II.*	Ec.	Dis.
	2	37		II.	Sh.	Eg.		20	33	19		I.	Ec.	Dis.		14	9		I.*	Sh.	In.
	2	57		I.	Sh.	In.		21	58			IV.	Sh.	In.		14	13		III.*	Sh.	Eg.
	4	19		I.	Tr.	In.	12	0	6			I.	Oc.	Re.		15	22		I.*	Tr.	In.
	5	15		I.	Sh.	Eg.		1	41			IV.	Sh.	Eg.		16	3		III.*	Tr.	In.
	5	22		II.	Tr.	Eg.		11	8			IV.	Tr.	In.		16	27		I.	Sh.	Eg.
	6	36		I.	Tr.	Eg.		13	15			IV.*	Tr.	Eg.		17	39		I.	Tr.	Eg.
8	0	10	35	I.	Ec.	Dis.		15	40			II.*	Sh.	In.		18	14		II.	Oc.	Re.
	3	47		I.	Oc.	Re.		17	47			I.	Sh.	In.		18	54		III.	Tr.	Eg.
	11	32	12	IV.	Ec.	Dis.		18	21			II.	Tr.	In.	22	11	24	49	I.*	Ec.	Dis.
	13	5	6	III.*	Ec.	Dis.		18	33			II.	Sh.	Eg.		14	52		I.*	Oc.	Re.
	15	3	53	IV.*	Ec.	Re.		19	6			I.	Tr.	In.	23	7	36		II.	Sh.	In.
	16	11	6	III.	Ec.	Re.		20	5			I.	Sh.	Eg.		8	38		I.	Sh.	In.
	18	38	18	II.	Ec.	Dis.		21	10			II.	Tr.	Eg.		9	49		I.	Tr.	In.
	18	39		III.	Oc.	Dis.		21	22			I.	Tr.	Eg.		10	3		II.	Tr.	In.
	21	25		I.	Sh.	In.	13	15	1	57		I.*	Ec.	Dis.		10	28		II.*	Sh.	Eg.
	21	34		III.	Oc.	Re.		18	34			I.	Oc.	Re.		10	56		I.*	Sh.	Eg.
	22	47		I.	Tr.	In.	14	6	59			III.	Sh.	In.		12	6		I.*	Tr.	Eg.
	23	43		I.	Sh.	Eg.		10	13			III.	Sh.	Eg.		12	51		II.*	Tr.	Eg.
4	0	6		II.	Oc.	Re.		10	29	54		II.	Ec.	Dis.	24	5	53	28	I.	Ec.	Dis.
	0	46		IV.	Oc.	Dis.		12	16			I.*	Sh.	In.		9	19		I.	Oc.	Re.
	1	4		I.	Tr.	Eg.		12	20			III.*	Tr.	In.	25	1	7	56	III.	Ec.	Dis.
	3	12		IV.	Oc.	Re.		13	33			I.*	Tr.	In.		2	21	32	II.	Ec.	Dis.
	18	39	4	I.	Ec.	Dis.		14	34			I.*	Sh.	Eg.		3	6		I.	Sh.	In.
	22	15		I.	Oc.	Re.		15	12			III.*	Tr.	Eg.		4	10	36	III.	Ec.	Re.
5	13	3		II.*	Sh.	In.		15	48			II.*	Oc.	Re.		4	16		I.	Tr.	In.
	15	50		II.*	Tr.	In.		15	50			I.*	Tr.	Eg.		5	24		I.	Sh.	Eg.
	15	54		I.*	Sh.	In.	15	9	30	29		I.	Ec.	Dis.		5	56		III.	Oc.	Dis.
	15	56		II.*	Sh.	Eg.		13	2			I.*	Oc.	Re.		6	33		I.	Tr.	Eg.
	17	15		I.	Tr.	In.	16	4	58			II.	Sh.	In.		7	25		II.	Oc.	Re.
	18	12		I.	Sh.	Eg.		6	44			I.	Sh.	In.		8	45		III.	Oc.	Re.
	18	39		II.	Tr.	Eg.		7	35			II.	Tr.	In.	26	0	21	59	I.	Ec.	Dis.
	19	32		I.	Tr.	Eg.		7	51			II.	Sh.	Eg.		3	46		I.	Oc.	Re.
6	13	7	41	I.*	Ec.	Dis.		8	0			I.	Tr.	In.		20	55		II.	Sh.	In.
	16	43		I.	Oc.	Re.		9	2			I.	Sh.	Eg.		21	35		I.	Sh.	In.
7	2	58		III.	Sh.	In.		10	17			I.	Tr.	Eg.		22	44		I.	Tr.	In.
	6	14		III.	Sh.	Eg.		10	24			II.	Tr.	Eg.		23	16		II.	Tr.	In.
	7	55	30	II.	Ec.	Dis.	17	3	59	7		I.	Ec.	Dis.		23	48		II.	Sh.	Eg.
	8	33		III.	Tr.	In.		7	29			I.	Oc.	Re.		23	52		I.	Sh.	Eg.
	10	22		I.	Sh.	In.		21	6	49		III.	Ec.	Dis.	27	1	0		I.	Tr.	Eg.
	11	27		III.	Tr.	Eg.		23	47	7		II.	Ec.	Dis.		2	5		II.	Tr.	Eg.
	11	43		I.*	Tr.	In.	18	0	10	37		III.	Ec.	Re.		18	50	39	I.	Ec.	Dis.
	12	40		I.*	Sh.	Eg.		1	12			I.	Sh.	In.		22	13		I.	Oc.	Re.
	13	21		II.*	Oc.	Re.		2	15			III.	Oc.	Dis.	28	15	0		III.*	Sh.	In.
	13	59		I.*	Tr.	Eg.		2	28			I.	Tr.	In.		15	38	46	II.*	Ec.	Dis.
8	7	36	13	I.	Ec.	Dis.		3	30			I.	Sh.	Eg.		16	3		I.*	Sh.	In.
	11	11		I.	Oc.	Re.		4	44			I.	Tr.	Eg.		16	14		IV.*	Sh.	In.
9	2	21		II.	Sh.	In.		5	1			II.	Oc.	Re.		17	10		I.	Tr.	In.
	4	50		I.	Sh.	In.		5	6			III.	Oc.	Re.		18	12		III.	Sh.	Eg.
	5	5		II.	Tr.	In.		22	27	37		I.	Ec.	Dis.		19	27		I.	Tr.	Eg.
	5	14		II.	Sh.	Eg.	19	1	57			I.	Oc.	Re.		19	41		III.	Tr.	In.
	6	10		I.	Tr.	In.		18	18			II.	Sh.	In.		19	50		IV.	Sh.	Eg.
	7	9		I.	Sh.	Eg.		19	41			I.	Sh.	In.		20	37		II.	Oc.	Re.
	7	54		II.	Tr.	Eg.		20	50			II.	Tr.	In.		22	30		III.	Tr.	Eg.
	8	27		I.	Tr.	Eg.		20	55			I.	Tr.	In.	29	3	43		IV.	Tr.	In.
10	2	4	49	I.	Ec.	Dis.		21	10			II.	Sh.	Eg.		5	24		I.*	Ec.	Dis.
	5	39		I.	Oc.	Re.		21	59			I.	Sh.	Eg.	30	13	19	13	I.	Oc.	Re.
	17	5	44	III.	Ec.	Dis.		23	12			II.	Sh.	Eg.		16	40		II.*	Sh.	In.
	20	10	38	III.	Ec.	Re.		23	38			I.	Tr.	Eg.		10	14		I.*	Sh.	In.
	21	12	43	II.	Ec.	Dis.	20	5	47	23		IV.	Ec.	Dis.		10	38		I.*	Tr.	In.
	22	29		III.	Oc.	Dis.		9	10	29		IV.	Ec.	Re.		11	37		II.*	Tr.	In.
	23	19		I.	Sh.	In.		16	56	16		I.	Ec.	Dis.		12	28		I.*	Sh.	Eg.
11	0	38		I.	Tr.	In.		17	52			IV.	Oc.	Dis.		13	6		II.*	Sh.	Eg.
															31	7	47	53	I.	Ec.	Dis.
																11	7		I.*	Oc.	Re.

Norw.—In. denotes ingress; Eg., egress; Dis., disappearance; Re., reappearance; Ec., eclipse.  
Oc. denotes occultation; Tr., transit of the satellite; Sh., transit of the shadow; \* Visible at Washington.  
[Eph 15]

WASHINGTON MEAN TIME.

JULY.

Phases of the Eclipses of the Satellites for an Inverting Telescope.

<div>* d</div> <div></div>	III.	<div><div>* d</div><div>* r</div></div> <div></div>
<div></div>	IV.	<div><div>* d</div><div>* r</div></div> <div></div>

Configurations at 13<sup>h</sup> 30<sup>m</sup> for an Inverting Telescope.

West.			East.		
4	3	○	1	2	
	4 3	○			
		○	1		3 ● 4 ●
		○	4	3	
		○	2 1	4 3	
	2	○	3	4	1 ●
		○		2	4
	3	○	1	2	4
		○			4
		○	1	4	
		○	3 1		
	4 2	○		3	
		○	1		2 ●
4	3	○	1	2	
4		○			
		○	1		
4		○	3 2		
	4	○	1 2	3	
	2 1 4	○		3	
		○	1	4	2 ●
	3	○	2	4	1 ●
		○			4
		○	1		4
		○	3 2		4
		○	1 2	3	4
	2 1	○		3 4	
		○	1 4		
	3 4	○		2	1 ●
1	3 4	○			
4	3 2	○	1		

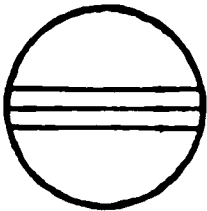
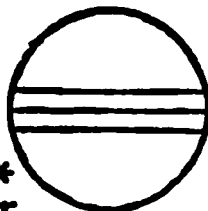
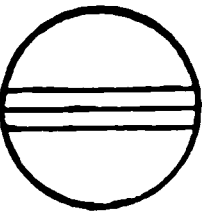
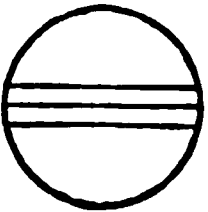
WASHINGTON MEAN TIME.

AUGUST.

WASHINGTON MEAN TIME.

AUGUST.

Phases of the Eclipses of the Satellites for an Inverting Telescope.

<div><div>* d</div><div></div></div>	III.	<div><div>* d</div><div></div></div> <div><div>* r</div></div>
<div><div>* d</div><div></div></div>	IV.	<div><div>* d</div><div></div></div> <div><div>* r</div></div>

Configurations at 12<sup>h</sup> 45<sup>m</sup> for an Inverting Telescope.

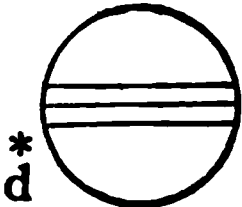
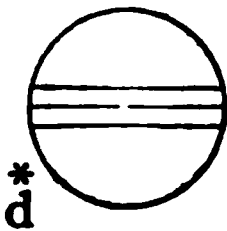
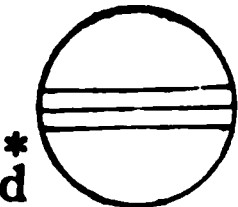
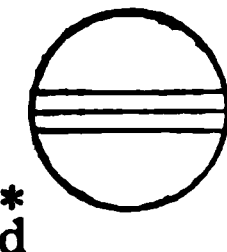
West.			East.		
4°	1°	○ 3° 2			
4°		○	12°	3°	
4°	1°	○		3°	
4°	2°	○	13°		
	43° 1°	○	2°		
3°		○ 12° 4			
3 2°		○	4°		1 ●
	1° 3 2	○ 2	4°		
		○	1 2° 3	4°	
	12°	○	3°	4°	
2°		○	1 3°	4°	
1°		○	2°	4°	
3°		○ 12°	4°		
3 2°		○ 4°			1 ●
4°	1° 3	○			2 ●
4°		○	1°	1° 3	
4°	12°	○		3°	
4°	2°	○	1 3°		
4	13°	○	2°		
4	3°	○	12°		
4 3 2°	1°	○			
	4 3	○			2 ●
		○	1 4	1° 3	
	1 2°	○		4 3	
2°		○	1 3°	4°	
1 3°		○	2°	4°	
3°		○	12°	4°	
3 2° 1°		○		4°	
3 2	1°	○ 1°		4°	
		○ 1	1° 3 2		
	1 4°	○	3°		



WASHINGTON MEAN TIME.

SEPTEMBER.

Phases of the Eclipses of the Satellites for an Inverting Telescope.

	III.	
	IV.	

Configurations at 12<sup>h</sup> 0<sup>m</sup> for an Inverting Telescope.

West.			East.
4° 2	○	1° 3°	
4° 1°	○ <sub>3</sub>	2°	
4° 3°	○	1° 2°	
4° 3 2° 1	○		
4 3 2	○	1°	
4 3 2	○	3° 2	1●
4 1° 2°	○	3	
2 4 1	○	3°	
1° 3 2 4	○		
3° 1 2°	○	4	
3° 1 4	○		4
3 2 1°	○	1°	4
1° 3 2	○		4°
	○	2° 3 4°	
2° 1°	○	1° 4 3	2●
3° 4°	○	1° 2°	
4 3 12°	○		
4° 3 2	○	1°	
4° 1	○	2°	3●
4 1° 2°	○	3	
4 2°	○	3°	1●
4 1°	○		2●
4 3 1° 2°	○		
3° 1° 2°	○	4	
3 2	○	1° 4	
1 2	○		4
	○	1° 2° 3 4	
2°	○	3° 4 1●	
1°	○	3 4	



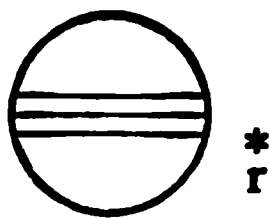


WASHINGTON MEAN TIME.

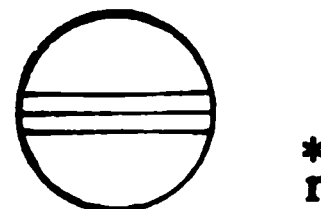
OCTOBER.

Phases of the Eclipses of the Satellites for an Inverting Telescope.

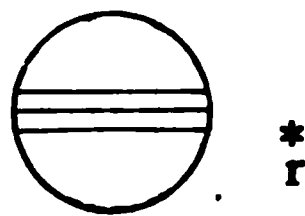
I.



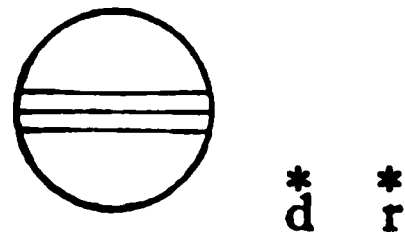
III.



II.



IV.



Configurations at 10<sup>h</sup> 30<sup>m</sup> for an Inverting Telescope.

Day.	West.				East.			
1			3'	○	'1	'2	4'	
2	○ 2'	3'	1'	○		4'		
3		'3	'2	○	'4	'1		
4			4' '1	○	'2	'3		
5		4'		○	1' 2' 3'			
6		4'	2' '1	○		'3		
7		4'	'2	○	1' 3'			
8		'4	3'	○	'2			'1 ●
9		'4	3' 1'	○	2'			
10		'3	'4 '2	○	'1			
11			1' '3	○	'2			
12				○	1' 2' 3' 4'			
13			2' '1	○		'3		
14			'2	○	1' 3'	'4		
15	○ 3'			○	'2	'4	'1	●
16		3'	1'	○	2'	4'		
17		'3	2'	○	'1	4'		
18			1' '3	○		4'		'2 ●
19				○	1' 2' 3' 4'			
20			'1 4'	○		'3		
21		4'	'2	○	1' 3'			
22		4'		○	1' 2'			
23	○ 1'	4'	3'	○	2'			
24		'4	'3 2'	○	'1			
25		'4	'3 1'	○				'2 ●
26		'4		○	'3 '1 2'			
27			'4 '1 2'	○		'3		
28			'2	○	1' 3'			'4 ●
29			'1	○	3' 2' 4'			
30	○ 1'		3'	○	2'	'4		
31		3'	2'	○		'4	'1	●

## WASHINGTON MEAN TIME.

## NOVEMBER.

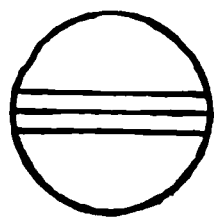
d	h	m	s		d	h	m	s		d	h	m	s		d	h	m	s	
1	4	48			10	12	52			20	18	9			30	18	9		
	5	50				15	12				19	24				19	24		
	7	5				22	24				1	45			21	1	45		
	8	7			11	1	49	20			4	19				4	19		
	12	31				19	32				4	36				4	36		
	17	22	53			20	43				7	8				7	8		
2	2	7				21	49				13	12				13	12		
	5	11				23	0				16	42	42			16	42		
	5	24	53		12	4	8			22	10	19				10	19		
	8	14				9	18	24			11	37				11	37		
	9	34	50			16	52				12	0				12	0		
	12	20	5			20	18	11			12	37				12	37		
	23	15				22	32				13	53				13	53		
3	0	19			13	1	36				15	11				15	11		
	1	32				3	27				19	52				19	52		
	2	35				6	21				0	45			23	0	45		
	7	36				14	0				1	14	44			1	14		
	9	45				15	12				2	53				2	53		
	10	26				16	17				7	40				7	40		
	12	34				17	29				11	11	33			11	11		
	20	35				23	16				16	18				16	18		
	23	53	48		14	1	41				19	24				19	24		
4	17	42				2	6				21	43	35			21	43		
	18	48				2	9				0	24	46			0	24		
	19	59				4	30				4	48				4	48		
	21	4				5	15				6	6				6	6		
6	1	43				11	20				7	5				7	5		
	6	41	15			14	4	44			8	22				8	22		
	15	2				14	47	8			15	1				15	1		
	18	22	38			15	59	27			17	36				17	36		
	18	53			15	8	28				17	52				17	52		
	19	32				9	41				20	26				20	26		
	21	56			16	10	45				2	8	28			2	8		
	22	31				11	58				5	40				5	40		
	23	24				17	22				23	16				23	16		
8	2	20				22	37	14			0	35				0	35		
	6	19			16	5	48				1	33				1	33		
	8	44				9	15	59			2	51				2	51		
	12	10				12	31				9	8				9	8		
	13	16				15	36				14	33	18			14	33		
	14	27				17	40	51			20	36				20	36		
	15	33				20	23	24			0	9	20			0	9		
	20	48			17	2	55				6	6				6	6		
	23	4				4	10				9	13				9	13		
7	23	39				5	13				11	33				11	33		
	1	53				6	26				14	24				14	24		
	9	29				12	30				17	44				17	44		
	12	51	35			15	0				19	4				19	4		
8	6	37				15	21				20	2				20	2		
	7	45				17	49				21	20				21	20		
	8	54			18	0	16				4	17				4	17		
	10	2				3	44	54			6	56				6	56		
	14	56				21	23				7	8				7	8		
	19	59	57			22	39				9	45				9	45		
9	3	57				23	41				15	5				15	5		
	7	20	25			0	55				18	38	17			18	38		
	8	49			19	6	37				12	12				12	12		
	11	52				11	55	45			13	32				13	32		
	13	38	7			18	44				14	30				14	30		
	16	22	2			22	13	45			15	49				15	49		
10	1	4			20	2	16				21	24				21	24		
	2	14				5	22				3	52	25			3	52		
	3	22				7	30				3	33				3	33		
	4	31				10	23				13	7	8			13	7		
	10	2				15	51				19	12				19	12		
	12	23				17	8				20	20				20	20		
											21	25				21	25		
											22	18				22	18		

NOTE.—In. denotes ingress; Eg., egress; Dis., disappearance; Re., reappearance; Ec., eclipse.  
Oc. denotes occultation; Tr., transit of the satellite; Sh., transit of the shadow; \* Value at Washington.  
[Eph 15]

WASHINGTON MEAN TIME.

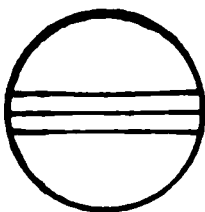
NOVEMBER.

Phases of the Eclipses of the Satellites for an Inverting Telescope.



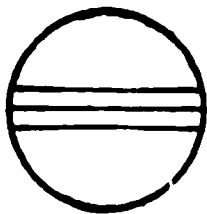
\*  
r

III.



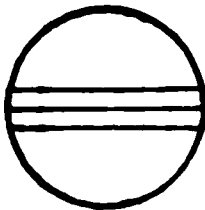
\*  
d

\*  
r



\*  
r

IV.



\*  
d

\*  
r

Configurations at 9<sup>h</sup> 0<sup>m</sup> for an Inverting Telescope.

West.

East.

3

1<sup>1</sup>/<sub>2</sub>

○

4

○

3

1

2

4

1

○

3

4

2

○

1

4 3

1

○

4<sup>1</sup>/<sub>2</sub> 3<sup>1</sup>/<sub>2</sub>

3 4

○

1

2

4<sup>1</sup>/<sub>2</sub> 3<sup>1</sup>/<sub>2</sub>

2

1

○

4

3

2

1

○

4

○

1

2

3 ●

4

1

○

2

3

4

2

○

1

3

4

1

○

3

2 ●

4 3

○

1

2

3

2

1

○

4

3

2

○

4

3

○

2

4

1 ●

1

○

2

3

4

2

○

1

3

4

1

○

3

4

2 ●

3

○

1 2

4

3

1

○

4

3

2

○

4<sup>1</sup>/<sub>2</sub> 1<sup>1</sup>/<sub>2</sub>

4

3

○

2

1 ●

4

1

○

2

3

4

2

○

1

3

4

1

○

3

4

3

1 2

○

3<sup>1</sup>/<sub>4</sub> 4<sup>1</sup>/<sub>4</sub>

2

○

1

3 4

○

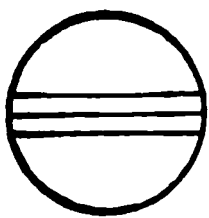
2



WASHINGTON MEAN TIME.

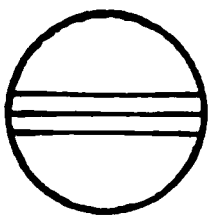
DECEMBER.

Phases of the Eclipses of the Satellites for an Inverting Telescope.



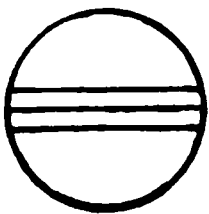
\*  
r

III.



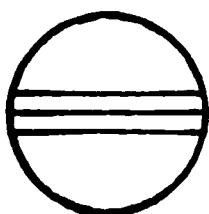
\*  
d

\*  
r



\*  
r

IV.



\*  
d

\*  
r

Configurations at 8<sup>h</sup> 0<sup>m</sup> for an Inverting Telescope.

West.

East.

		○	<sup>2</sup> 4 3	
	2°	○	1°	<sup>3</sup> 4
	1° 2	○	3°	4°
		○	3° 1° 2	4°
	3° 1°	○		4°
	3° 2	○	1°	4°
	3° 1	○	2°	4°
		○	1° 2 4°	3° ●
1	2°	○	3°	1° ●
	4° 2 1°	○	3°	
	4°	○	3° 1° 2	
	4° 3° 1°	○	2°	
	4° 3° 2	○	1°	
	4° 3° 1	○		2° ●
	4°	○	3 1° 2°	
	4° 2°	○	3°	1° ●
	2° 4 1°	○	3°	
		○	1 3° 4°	
	3° 1°	○	2°	4°
	3° 2°	○	1°	4°
	3° 1	○		4° 2° ●
	3°	○	1° 2°	4°
	2° 1	○	3°	4°
	2°	○	3 4°	
		○	1° 4° 3°	
	<sup>3</sup> 1 4°	○	2°	
	3 4° 2°	○	1°	
	4° 3° 1° 2°	○		
	4° 3°	○	1° 2°	
	4° 1 2°	○	3°	
	4° 2°	○	1°	3°

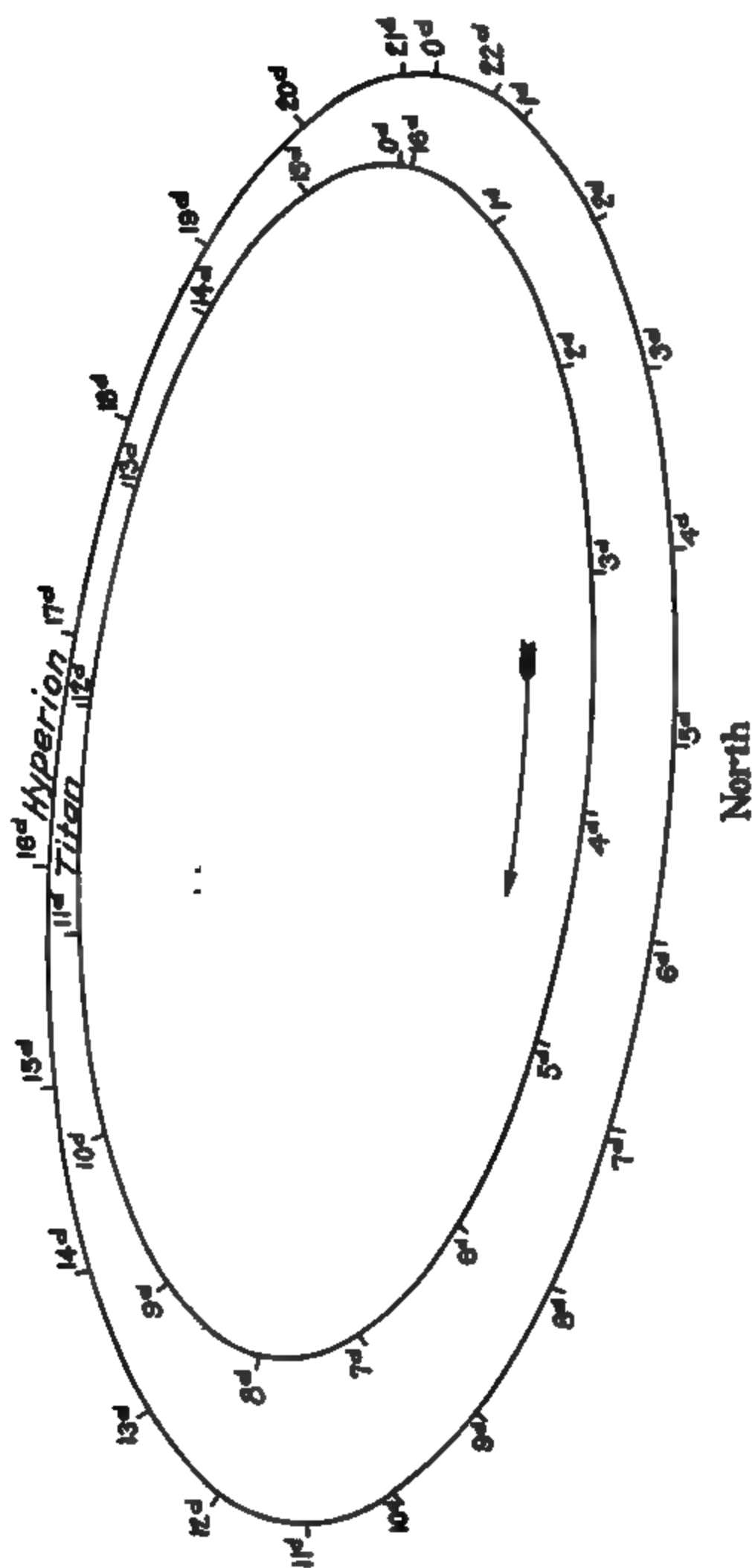
656 MAGNITUDE AND RINGS OF SATURN, 1915.

ELEMENTS FOR DETERMINING THE GEOCENTRIC POSITION, APPEARANCE, AND MAGNITUDE OF SATURN'S RINGS.

Washington Mean Noon.	<i>a</i>  Outer Major Axis.	<i>b</i>  Outer Minor Axis.	<i>p</i>  Inclination of Northern Semi-minor Axis to Circle of Declination from North to East.	<i>l</i>  The eleva- tion of the Earth above the Plane of the Rings.	<i>l'</i>  The Eleva- tion of the Sun above the Plane of the Rings.	Earth's Longitude from Saturn counted on Plane of Rings from the Rings' Ascending Node on—		Stellar Mag.
						Equator.	Ecliptic.	
	"	"	° '	° '	° '	° '	° '	
Jan.	0	46.61	-5 56.6	-26 32.1	-26 32.4	143 18.5	100 51.1	-0.2
	10	46.34	5 52.6	26 37.4	26 31.0	142 27.0	99 59.7	0.2
	20	45.90	5 49.0	26 42.2	26 29.6	141 41.6	99 14.4	-0.1
	30	45.33	5 46.0	26 46.4	26 28.0	141 4.9	98 37.7	0.0
Feb.	9	44.65	5 43.9	26 49.9	26 26.4	140 38.8	98 11.6	0.0
	19	43.90	-5 42.8	-26 52.8	-26 24.8	140 24.5	97 57.4	+0.1
Mar.	1	43.11	5 42.7	26 54.9	26 23.0	140 22.7	97 55.6	0.1
	11	42.31	5 43.7	26 56.2	26 21.2	140 33.5	98 6.5	0.2
	21	41.54	5 45.7	26 56.7	26 19.3	140 56.6	98 29.7	0.2
	31	40.80	5 48.6	26 56.3	26 17.4	141 31.2	99 4.4	0.3
Apr.	10	40.11	-5 52.4	-26 55.0	-26 15.3	142 16.5	99 49.7	+0.3
	20	39.48	5 56.8	26 52.4	26 13.2	143 11.2	100 44.5	0.3
	30	38.93	6 1.8	26 48.8	26 11.0	144 14.2	101 47.5	0.3
May	10	38.46	6 7.0	26 43.8	26 8.8	145 24.2	102 57.5	0.3
	20	38.07	6 12.6	26 37.6	26 6.5	146 39.8	104 13.2	0.3
	30	37.77	-6 18.2	-26 30.1	-26 4.1	147 59.9	105 33.3	+0.3
June	9	37.56	6 23.8	26 21.2	26 1.6	149 23.1	106 56.6	0.3
	19	37.43	6 29.3	26 11.2	25 59.1	150 48.3	108 21.9	0.2
	29	37.39	6 34.5	26 0.0	25 56.5	152 14.2	109 47.9	0.2
July	9	37.44	6 39.4	25 48.0	25 53.8	153 39.7	111 13.4	0.2
	19	37.58	-6 43.9	-25 35.1	-25 51.1	155 3.6	112 37.4	+0.3
	29	37.81	6 48.1	25 21.9	25 48.3	156 24.9	113 58.7	0.3
Aug.	8	38.12	6 51.7	25 8.5	25 45.4	157 42.3	115 16.2	0.3
	18	38.52	6 54.9	24 55.2	25 42.5	158 54.7	116 28.7	0.4
	28	39.00	6 57.7	24 42.4	25 39.5	160 1.1	117 35.0	0.4
Sept.	7	39.56	-7 0.0	-24 30.6	-25 36.4	161 0.2	118 34.2	+0.4
	17	40.19	7 1.8	24 20.1	25 33.2	161 51.1	119 25.2	0.4
	27	40.88	7 3.3	24 11.2	25 29.9	162 32.7	120 6.8	0.3
Oct.	7	41.63	7 4.3	24 4.6	25 26.6	163 4.0	120 38.2	0.3
	17	42.41	7 5.0	24 0.3	25 23.3	163 24.2	120 58.5	0.3
	27	43.20	-7 5.2	-23 58.7	-25 19.9	163 32.9	121 7.2	+0.2
Nov.	6	43.98	7 5.2	23 59.9	25 16.4	163 29.5	121 3.9	0.2
	16	44.71	7 4.7	24 3.7	25 12.8	163 14.4	120 48.9	+0.1
	26	45.37	7 3.9	24 10.2	25 9.2	162 48.3	120 22.7	0.0
Dec.	6	45.92	7 2.7	24 18.9	25 5.5	162 12.2	119 46.7	-0.1
	16	46.33	-7 1.1	-24 29.2	-25 1.7	161 28.0	119 2.6	-0.1
	26	46.58	6 59.3	24 40.6	24 57.9	160 38.1	118 12.7	0.2
	31	46.64	-6 58.3	-24 46.5	-24 56.0	160 11.9	117 46.6	-0.2

The factor to be multiplied by *a* and *b* to obtain the axes of—  
The inner ellipse of the outer ring=0.8801, log factor=9.9445  
The outer ellipse of the inner ring=0.8599, log factor=9.9344  
The inner ellipse of the inner ring=0.6650, log factor=9.8228  
The inner ellipse of the dusky ring=0.5486, log factor=9.7392

NOTE.—The negative sign of *l* indicates that the visible surface of the rings is the southern one.



MEAN SYNODIC PERIODS.

	d	h
I.	0	22.6
II.	1	8.9
III.	1	21.3
IV.	2	17.7
V.	4	12.5
VI.	15	23.3
VII.	21	7.6
VIII.	79	22.1
IX.	523	15.6

APPARENT ORBITS OF THE SEVEN INNER SATELLITES OF SATURN,  
AT DATE OF OPPOSITION, JANUARY 4, 1916,  
AS SEEN IN AN INVERTING TELESCOPE.

NAMES OF THE SATELLITES.

- I. Mimas.
- II. Enceladus.
- III. Tethys.
- IV. Dione.
- V. Rhea.
- VI. Titan.
- VII. Hyperion.
- VIII. Iapetus.
- IX. Phoebe.



WASHINGTON MEAN TIME OF GREATEST ELONGATION, ETC.

In the diagram on the preceding page, the points of the orbits marked "o" are those of the eastern elongation, as seen in an inverting telescope. The times of these elongations may be found from the following tables, and the apparent position of a satellite at any other time may be marked on the diagram by setting off on the proper orbit the elapsed interval in days and hours since the last eastern elongation. The orbits of the five inner satellites are regarded as circular and the time of any elongation not given in the tables may be readily found from those given by adding or subtracting the proper multiple of the mean synodic period. Mimas can be seen only within a few hours of each elongation, and the time of every elongation visible at Washington is given. For Titan, Hyperion and Iapetus the eccentricity is taken into account, and the times both of the elongations and of the conjunctions are given. The following abbreviations are used in the tables:

- E., East Elongation.  
W., West Elongation.
- I., Inferior Conjunction (north of planet).  
S., Superior Conjunction (south of planet).

MIMAS.

Greatest Elongations Visible at Washington.

Jan.	d h	Jan.	d h	Feb.	d h	Oct.	d h	Nov.	d h	Dec.	d h
1	15.6 W.	22	9.0 W.	16	8.4 E.	18	11.9 E.	18	14.2 E.	12	14.9 W.
2	14.2 W.	23	7.6 W.	17	7.0 E.	22	17.8 W.	19	12.8 E.	13	13.5 W.
3	12.8 W.	24	6.3 W.	20	14.1 W.	23	16.4 W.	20	11.4 E.	14	12.1 W.
4	11.4 W.	25	16.2 E.	21	12.7 W.	24	15.0 W.	21	10.0 E.	15	10.8 W.
5	10.0 W.	26	14.8 E.	22	11.3 W.	25	13.6 W.	22	8.6 E.	16	9.4 W.
6	8.6 W.	27	13.4 E.	23	10.0 W.	26	12.2 W.	24	17.3 W.	17	8.0 W.
7	7.2 W.	28	12.0 E.	24	8.6 W.	27	10.8 W.	25	15.9 W.	18	6.6 W.
8	5.8 W.	29	10.6 E.	25	7.2 W.	30	17.9 E.	26	14.5 W.	18	17.8 E.
8	17.1 E.	30	9.2 E.	Mar. 1	13.0 E.	31	16.5 E.	27	13.1 W.	19	16.4 E.
9	15.7 E.	31	7.8 E.	2	11.7 E.	Nov. 1	15.1 E.	28	11.7 W.	20	15.0 E.
10	14.3 E.	Feb. 1	6.5 E.	3	10.3 E.	2	13.7 E.	29	10.4 W.	21	13.6 E.
11	12.9 E.	3	15.0 W.	4	8.9 E.	3	12.3 E.	30	9.0 W.	22	12.2 E.
12	11.6 E.	4	13.6 W.	5	7.5 E.	4	11.0 E.	Dec. 2	17.4 E.	23	10.8 E.
13	10.2 E.	5	12.2 W.	9	13.2 W.	5	9.6 E.	3	16.0 E.	24	9.4 E.
14	8.8 E.	6	10.8 W.	10	11.9 W.	8	16.8 W.	4	14.6 E.	25	8.1 E.
15	7.4 E.	7	9.5 W.	11	10.5 W.	9	15.4 W.	5	13.2 E.	26	6.7 E.
16	6.0 E.	8	8.1 W.	12	9.1 W.	10	14.1 W.	6	11.8 E.	26	18.1 W.
17	16.0 W.	9	6.7 W.	13	7.7 W.	11	12.7 W.	7	10.4 E.	27	16.7 W.
18	14.6 W.	12	13.9 E.	.	.	12	11.3 W.	8	9.0 E.	28	15.3 W.
19	13.2 W.	13	12.5 E.	Oct. 15	16.0 E.	13	9.9 W.	9	7.7 E.	29	13.9 W.
20	11.8 W.	14	11.1 E.	16	14.6 E.	16	16.9 E.	10	17.7 W.	30	12.5 W.
21	10.4 W.	15	9.8 E.	17	13.3 E.	17	15.5 E.	11	16.3 W.	31	11.1 W.

ENCELADUS.

Jan.	d h	Jan.	d h	Jan.	d h	Feb.	d h	Feb.	d h	Mar.	d h
1	7.1 E.	14	23.9 E.	28	16.7 E.	11	9.5 E.	25	2.4 E.	10	19.3 E.
2	16.0 E.	16	8.8 E.	30	1.6 E.	12	18.4 E.	26	11.3 E.	12	4.2 E.
4	0.9 E.	17	17.6 E.	31	10.4 E.	14	3.3 E.	27	20.2 E.	13	13.1 E.
5	9.8 E.	19	2.5 E.	Feb. 1	19.3 E.	15	12.2 E.	Mar. 1	5.0 E.	14	22.0 E.
6	18.6 E.	20	11.4 E.	3	4.2 E.	16	21.0 E.	2	13.9 E.	16	6.8 E.
8	3.5 E.	21	20.3 E.	4	13.1 E.	18	5.9 E.	3	22.8 E.	17	15.7 E.
9	12.4 E.	23	5.2 E.	5	22.0 E.	19	14.8 E.	5	7.7 E.	19	0.6 E.
10	21.3 E.	24	14.0 E.	7	6.9 E.	20	23.7 E.	6	16.6 E.	20	9.5 E.
12	6.1 E.	25	22.9 E.	8	15.7 E.	22	8.6 E.	8	1.5 E.	21	18.4 E.
13	15.0 E.	27	7.8 E.	10	0.6 E.	23	17.5 E.	9	10.4 E.	23	3.3 E.

WASHINGTON MEAN TIME OF GREATEST ELONGATION.

ENCELADUS—(Concluded).

	d	h		d	h		d	h		d	h		d	h		d	h
Mar. 24	12.2	E.	Sept. 21	11.0	E.	Oct. 12	0.3	E.	Nov. 1	13.6	E.	Nov. 22	2.8	E.	Dec. 12	15.9	E.
25	21.1	E.	22	19.9	E.	13	9.2	E.	2	22.5	E.	23	11.7	E.	14	0.8	E.
27	6.0	E.	24	4.8	E.	14	18.1	E.	4	7.4	E.	24	20.5	E.	15	9.7	E.
28	14.9	E.	25	13.7	E.	16	3.0	E.	5	16.2	E.	26	5.4	E.	16	18.5	E.
29	23.8	E.	26	22.6	E.	17	11.9	E.	7	1.1	E.	27	14.3	E.	18	3.4	E.
31	8.7	E.	28	7.4	E.	18	20.8	E.	8	10.0	E.	28	23.2	E.	19	12.3	E.
pr. 1	17.6	E.	29	16.3	E.	20	5.6	E.	9	18.9	E.	30	8.0	E.	20	21.2	E.
3	2.5	E.	Oct. 1	1.2	E.	21	14.5	E.	11	3.8	E.	Dec. 1	16.9	E.	22	6.0	E.
4	11.4	E.	2	10.1	E.	22	23.4	E.	12	12.6	E.	3	1.8	E.	23	14.9	E.
5	20.3	E.	3	19.0	E.	24	8.3	E.	13	21.5	E.	4	10.7	E.	24	23.8	E.
7	5.2	E.	5	3.9	E.	25	17.2	E.	15	6.4	E.	5	19.5	E.	26	8.7	E.
8	14.0	E.	6	12.8	E.	27	2.1	E.	16	15.3	E.	7	4.4	E.	27	17.5	E.
pt. 18	17.2	E.	7	21.7	E.	28	11.0	E.	18	0.1	E.	8	13.3	E.	29	2.4	E.
20	2.1	E.	9	6.6	E.	29	19.8	E.	19	9.0	E.	9	22.2	E.	30	11.3	E.
			10	15.4	E.	31	4.7	E.	20	17.9	E.	11	7.0	E.	31	20.2	E.

TETHYS.

	d	h		d	h		d	h		d	h		d	h		d	h
a. 1	5.0	E.	Feb. 6	1.6	E.	Mar. 13	22.5	E.	Sept. 16	22.6	E.	Oct. 22	19.5	E.	Nov. 27	16.2	E.
3	2.3	E.	7	22.9	E.	15	19.8	E.	18	19.9	E.	24	16.8	E.	29	13.5	E.
4	23.6	E.	9	20.2	E.	17	17.1	E.	20	17.2	E.	26	14.1	E.	Dec. 1	10.8	E.
6	20.9	E.	11	17.5	E.	19	14.4	E.	22	14.5	E.	28	11.4	E.	3	8.1	E.
8	18.2	E.	13	14.8	E.	21	11.8	E.	24	11.8	E.	30	8.7	E.	5	5.4	E.
10	15.4	E.	15	12.1	E.	23	9.1	E.	26	9.2	E.	Nov. 1	6.0	E.	7	2.6	E.
12	12.7	E.	17	9.4	E.	25	6.4	E.	28	6.5	E.	3	3.3	E.	8	23.9	E.
14	10.0	E.	19	6.7	E.	27	3.7	E.	30	3.8	E.	5	0.6	E.	10	21.2	E.
16	7.3	E.	21	4.0	E.	29	1.1	E.	Oct. 2	1.1	E.	6	21.9	E.	12	18.5	E.
18	4.6	E.	23	1.3	E.	30	22.4	E.	3	22.4	E.	8	19.2	E.	14	15.8	E.
20	1.9	E.	24	22.6	E.	Apr. 1	19.7	E.	5	19.7	E.	10	16.5	E.	16	13.1	E.
21	23.2	E.	26	20.0	E.	3	17.0	E.	7	17.0	E.	12	13.8	E.	18	10.4	E.
23	20.5	E.	28	17.3	E.	5	14.4	E.	9	14.4	E.	14	11.1	E.	20	7.6	E.
25	17.8	E.	Mar. 2	14.6	E.	7	11.7	E.	11	11.7	E.	16	8.4	E.	22	4.9	E.
27	15.1	E.	4	11.9	E.	9	9.0	E.	13	9.0	E.	18	5.7	E.	24	2.2	E.
29	12.4	E.	6	9.2	E.	11	6.4	E.	15	6.3	E.	20	3.0	E.	25	23.5	E.
31	9.7	E.	8	6.5	E.	13	3.7	E.	17	3.6	E.	22	0.3	E.	27	20.8	E.
b. 2	7.0	E.	10	3.8	E.	15	1.0	E.	19	0.9	E.	23	21.6	E.	29	18.1	E.
4	4.3	E.	12	1.2	E.	. . . .			20	22.2	E.	25	18.9	E.	31	15.4	E.

DIONE.

	d	h		d	h		d	h		d	h		d	h		d	h
a. 1	1.0	E.	Feb. 5	14.5	E.	Mar. 13	4.5	E.	Sept. 18	4.8	E.	Oct. 23	18.9	E.	Nov. 28	8.6	E.
3	18.6	E.	8	8.2	E.	15	22.2	E.	20	22.5	E.	26	12.6	E.	Dec. 1	2.2	E.
6	12.3	E.	11	1.8	E.	18	15.9	E.	23	16.2	E.	29	6.2	E.	3	19.9	E.
9	5.9	E.	13	19.5	E.	21	9.6	E.	26	9.9	E.	31	23.9	E.	6	13.5	E.
11	23.6	E.	16	13.2	E.	24	3.3	E.	29	3.6	E.	Nov. 3	17.6	E.	9	7.2	E.
14	17.2	E.	19	6.9	E.	26	21.0	E.	Oct. 1	21.3	E.	6	11.3	E.	12	0.8	E.
17	10.9	E.	22	0.6	E.	29	14.8	E.	4	15.0	E.	9	4.9	E.	14	18.5	E.
20	4.5	E.	24	18.2	E.	Apr. 1	8.5	E.	7	8.8	E.	11	22.6	E.	17	12.1	E.
22	22.2	E.	27	12.0	E.	4	2.2	E.	10	2.4	E.	14	16.3	E.	20	5.8	E.
25	15.8	E.	Mar. 2	5.6	E.	6	19.9	E.	12	20.1	E.	17	9.9	E.	22	23.4	E.
28	9.5	E.	4	23.3	E.	9	13.7	E.	15	13.8	E.	20	3.6	E.	25	17.0	E.
31	3.2	E.	7	17.0	E.	12	7.4	E.	18	7.5	E.	22	21.3	E.	28	10.7	E.
b. 2	20.8	E.	10	10.8	E.	. . . .			21	1.2	E.	25	14.9	E.	31	4.3	E.

WASHINGTON MEAN TIME OF GREATEST ELONGATION.

RHEA.			TITAN.			HYPERION.			
	d	h		d	h		d		
Jan.	2	12.8 E.	Sept.	26	7.6 E.	Jan.	1.3 W.	Sept.	7.9 I.
	7	1.1 E.		30	20.1 E.		7.0 S.		13.8 W.
	11	13.4 E.	Oct.	5	8.5 E.		11.7 E.		19.3 S.
	16	1.7 E.		9	21.0 E.		16.5 I.		24.1 E.
	20	14.0 E.		14	9.4 E.		22.4 W.		29.3 I.
	25	2.4 E.		18	21.9 E.		28.2 S.	Oct.	5.1 W.
	29	14.7 E.		23	10.3 E.		1.8 E.		10.6 S.
Feb.	3	3.1 E.	Nov.	27	22.8 E.	Nov.	6.7 I.		15.4 E.
	7	15.4 E.		1	11.2 E.		12.6 W.		20.6 I.
	12	3.8 E.		5	23.6 E.		18.3 S.		26.4 W.
	16	16.2 E.		10	11.9 E.		23.0 E.		31.9 S.
	21	4.6 E.		15	0.3 E.		27.8 I.	Nov.	5.7 E.
	25	17.1 E.		19	12.7 E.		5.7 W.		10.9 I.
Mar.	2	5.5 E.		24	1.0 E.		11.5 S.		16.8 W.
	6	18.0 E.		28	13.4 E.		16.2 E.		22.2 S.
	11	6.4 E.	Dec.	3	1.7 E.		21.1 I.		27.0 E.
	15	18.9 E.		7	14.0 E.		27.0 W.	Dec.	2.2 I.
	20	7.4 E.		12	2.4 E.	Apr.	1.7 S.		8.0 W.
	24	19.9 E.		16	14.7 E.		6.4 E.		13.4 S.
	29	8.4 E.		21	3.0 E.		11.3 I.		18.2 E.
Apr.	2	20.9 E.		25	15.3 E.		27.2 W.		23.4 I.
	.	.		30	3.6 E.		.		29.2 W.

IAPETUS.

Jan.	20.0 E.	Feb.	28.4 W.	Apr.	9.4 E.	Sept.	19.1 F.	Oct.	28.9 W.	Dec.	7.5 E.
Feb.	9.3 I.	Mar.	19.6 S.			Oct.	9.8 I.	Nov.	17.1 S.		27.6 I.

NINTH SATELLITE OF SATURN.

DIFFERENTIAL COORDINATES OF PHOEBE FOR 1915.

Washington Mean Noon.	$a_{Ph.} - a_{Sat.}$	$\delta_{Ph.} - \delta_{Sat.}$	Washington Mean Noon.	$a_{Ph.} - a_{Sat.}$	$\delta_{Ph.} - \delta_{Sat.}$	Washington Mean Noon.	$a_{Ph.} - a_{Sat.}$	$\delta_{Ph.} - \delta_{Sat.}$
	m s	' "		m s	' "		m s	' "
Jan. 1	-2 25.4	-2 11	Apr. 7	-1 4.1	-3 2	Sept. 30	+2 9.7	-0 36
5	2 26.1	2 25	11	0 56.8	2 54	Oct. 4	2 8.0	0 30
9	2 26.5	2 38	15	0 49.4	2 45	8	2 6.0	0 23
13	2 26.5	2 50	19	0 41.8	2 36	12	2 3.8	0 15
17	2 26.2	3 2	23	0 34.1	2 27	16	2 1.4	-0 6
21	2 25.4	3 12	27	0 26.3	2 19	20	1 58.9	+0 2
25	2 24.4	3 22	May 1	0 18.4	2 10	24	1 56.1	0 12
29	2 22.9	3 30	5	0 10.5	2 2	28	1 53.2	0 21
Feb. 2	2 21.1	3 38	9	-0 2.6	1 54	Nov. 1	1 50.1	0 31
6	2 18.9	3 44	13	+0 5.4	1 47	5	1 46.8	0 41
10	2 16.4	3 49	17	+0 13.2	-1 40	9	1 43.3	0 51
14	2 13.4	3 52		.	.	13	1 39.7	1 1
18	2 10.1	3 54	Aug. 13	+2 9.2	-1 10	17	1 36.0	1 13
22	2 6.4	3 55	17	2 10.9	1 10	21	1 32.1	1 24
26	2 2.4	3 55	21	2 12.2	1 9	25	1 28.1	1 34
Mar. 2	1 58.0	3 54	25	2 13.3	1 8	29	1 24.0	1 44
6	1 53.3	3 52	29	2 14.0	1 7	Dec. 3	1 19.7	1 54
10	1 48.2	3 49	Sept. 2	2 14.5	1 5	7	1 15.4	2 4
14	1 42.8	3 44	6	2 14.6	1 3	11	1 10.9	2 13
18	1 37.0	3 39	10	2 14.5	1 0	15	1 6.3	2 22
22	1 31.0	3 33	14	2 14.1	0 57	19	1 1.7	2 30
26	1 24.6	3 26	18	2 13.4	0 53	23	0 56.9	2 38
30	1 18.0	3 19	22	2 12.4	0 48	27	0 52.1	2 45
Apr. 3	-1 11.2	-3 11	26	+2 11.2	-0 42	31	+0 47.1	+2 51

[Eph 15]

FRACTIONS OF THE PERIODS OF REVOLUTION.

Fraction of a Revolution.	Mimas.	Enceladus.	Tethys.	Dione.	Rhea.	Titan.	Fraction of a Revolution.
	h	d h	d h	d h	d h	d h	
0.00	0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0.00
0.02	0.5	0 0.7	0 0.9	0 1.3	0 2.2	0 7.7	0.02
0.04	0.9	0 1.3	0 1.8	0 2.6	0 4.3	0 15.3	0.04
0.06	1.4	0 2.0	0 2.7	0 3.9	0 6.5	0 23.0	0.06
0.08	1.8	0 2.6	0 3.6	0 5.3	0 8.7	1 6.6	0.08
0.10	2.3	0 3.3	0 4.5	0 6.6	0 10.8	1 14.3	0.10
0.12	2.7	0 4.0	0 5.4	0 7.9	0 13.0	1 21.9	0.12
0.14	3.2	0 4.6	0 6.3	0 9.2	0 15.2	2 5.6	0.14
0.16	3.6	0 5.3	0 7.2	0 10.5	0 17.3	2 13.2	0.16
0.18	4.1	0 5.9	0 8.2	0 11.8	0 19.5	2 20.9	0.18
0.20	4.5	0 6.6	0 9.1	0 13.1	0 21.7	3 4.5	0.20
0.22	5.0	0 7.2	0 10.0	0 14.5	0 23.9	3 12.2	0.22
0.24	5.4	0 7.9	0 10.9	0 15.8	1 2.0	3 19.8	0.24
0.26	5.9	0 8.6	0 11.8	0 17.1	1 4.2	4 3.5	0.26
0.28	6.3	0 9.2	0 12.7	0 18.4	1 6.4	4 11.2	0.28
0.30	6.8	0 9.9	0 13.6	0 19.7	1 8.5	4 18.8	0.30
0.32	7.2	0 10.5	0 14.5	0 21.0	1 10.7	5 2.5	0.32
0.34	7.7	0 11.2	0 15.4	0 22.3	1 12.9	5 10.1	0.34
0.36	8.1	0 11.8	0 16.3	0 23.6	1 15.0	5 17.8	0.36
0.38	8.6	0 12.5	0 17.2	1 1.0	1 17.2	6 1.4	0.38
0.40	9.0	0 13.2	0 18.1	1 2.3	1 19.4	6 9.1	0.40
0.42	9.5	0 13.8	0 19.0	1 3.6	1 21.5	6 16.7	0.42
0.44	10.0	0 14.5	0 19.9	1 4.9	1 23.7	7 0.4	0.44
0.46	10.4	0 15.1	0 20.8	1 6.2	2 1.9	7 8.0	0.46
0.48	10.9	0 15.8	0 21.7	1 7.5	2 4.0	7 15.7	0.48
0.50	11.3	0 16.4	0 22.7	1 8.8	2 6.2	7 23.3	0.50
0.52	11.8	0 17.1	0 23.6	1 10.2	2 8.4	8 7.0	0.52
0.54	12.2	0 17.8	1 0.5	1 11.5	2 10.5	8 14.7	0.54
0.56	12.7	0 18.4	1 1.4	1 12.8	2 12.7	8 22.3	0.56
0.58	13.1	0 19.1	1 2.3	1 14.1	2 14.9	9 6.0	0.58
0.60	13.6	0 19.7	1 3.2	1 15.4	2 17.1	9 13.6	0.60
0.62	14.0	0 20.4	1 4.1	1 16.7	2 19.2	9 21.3	0.62
0.64	14.5	0 21.0	1 5.0	1 18.0	2 21.4	10 4.9	0.64
0.66	14.9	0 21.7	1 5.9	1 19.4	2 23.6	10 12.6	0.66
0.68	15.4	0 22.4	1 6.8	1 20.7	3 1.7	10 20.2	0.68
0.70	15.8	0 23.0	1 7.7	1 22.0	3 3.9	11 3.9	0.70
0.72	16.3	0 23.7	1 8.6	1 23.3	3 6.1	11 11.5	0.72
0.74	16.7	1 0.3	1 9.5	2 0.6	3 8.2	11 19.2	0.74
0.76	17.2	1 1.0	1 10.4	2 1.9	3 10.4	12 2.8	0.76
0.78	17.6	1 1.7	1 11.3	2 3.2	3 12.6	12 10.5	0.78
0.80	18.1	1 2.3	1 12.2	2 4.5	3 14.7	12 18.2	0.80
0.82	18.5	1 3.0	1 13.2	2 5.9	3 16.9	13 1.8	0.82
0.84	19.0	1 3.6	1 14.1	2 7.2	3 19.1	13 9.5	0.84
0.86	19.5	1 4.3	1 15.0	2 8.5	3 21.2	13 17.1	0.86
0.88	19.9	1 4.9	1 15.9	2 9.8	3 23.4	14 0.8	0.88
0.90	20.4	1 5.6	1 16.8	2 11.1	4 1.6	14 8.4	0.90
0.92	20.8	1 6.3	1 17.7	2 12.4	4 3.7	14 16.1	0.92
0.94	21.3	1 6.9	1 18.6	2 13.7	4 5.9	14 23.7	0.94
0.96	21.7	1 7.6	1 19.5	2 15.1	4 8.1	15 7.4	0.96
0.98	22.2	1 8.2	1 20.4	2 16.4	4 10.3	15 15.0	0.98
1.00	22.6	1 8.9	1 21.3	2 17.7	4 12.4	15 22.7	1.00

Six Inner Satellites of Saturn.			Hyperion.			Iapetus.		
Fraction of a Revolution.	$p^1$	$F$	Time from Eastern Elongation.	$p^1$	$F$	Time from Eastern Elongation.	$p^1$	$F$
	°		d	°		d	°	
0.00	83.3	1.000	0.0	81.6	0.953	0	81.2	1.028
0.02	80.3	0.993	0.5	77.7	0.944	2	79.6	1.016
0.04	77.3	0.974	1.0	73.6	0.916	4	77.9	0.982
0.06	74.0	0.942	1.5	69.3	0.873	6	76.1	0.926
0.08	70.5	0.899	2.0	64.3	0.816	8	73.9	0.848
0.10	66.6	0.845	2.5	58.5	0.750	10	71.3	0.753
0.12	62.1	0.782	3.0	51.6	0.677	12	67.8	0.641
0.14	56.7	0.713	3.5	42.9	0.603	14	62.8	0.517
0.16	50.2	0.640	4.0	31.9	0.535	16	54.4	0.388
0.18	42.0	0.567	4.5	18.1	0.482	18	37.8	0.264
0.20	31.5	0.501	5.0	1.8	0.454	20	1.6	0.187
0.22	18.1	0.448	5.5	344.6	0.458	22	316.5	0.221
0.24	2.0	0.418	6.0	328.8	0.494	24	293.0	0.331
0.26	344.7	0.418	6.5	315.7	0.552	26	281.9	0.460
0.28	328.6	0.448	7.0	305.4	0.624	28	275.7	0.586
0.30	315.2	0.501	7.5	297.3	0.701	30	271.6	0.701
0.32	304.7	0.567	8.0	290.8	0.777	32	268.6	0.800
0.34	296.5	0.640	8.5	285.5	0.849	34	266.2	0.878
0.36	289.9	0.713	9.0	280.9	0.912	36	264.2	0.934
0.38	284.6	0.782	9.5	276.9	0.965	38	262.4	0.966
0.40	280.1	0.845	10.0	273.3	1.006	40	260.6	0.972
0.42	276.2	0.899	10.5	269.8	1.031	42	258.8	0.952
0.44	272.7	0.942	11.0	266.5	1.042	44	256.8	0.908
0.46	269.4	0.974	11.5	263.3	1.036	46	254.6	0.841
0.48	266.3	0.993	12.0	260.0	1.014	48	252.0	0.753
0.50	263.3	1.000	12.5	256.4	0.976	50	248.5	0.647
0.52	260.3	0.993	13.0	252.4	0.921	52	243.6	0.527
0.54	257.3	0.974	13.5	247.9	0.851	54	235.6	0.400
0.56	254.0	0.942	14.0	242.5	0.768	56	220.5	0.279
0.58	250.5	0.899	14.5	235.7	0.676	58	187.7	0.194
0.60	246.6	0.845	15.0	226.7	0.580	60	142.6	0.212
0.62	242.1	0.782	15.5	214.1	0.489	62	116.6	0.314
0.64	236.7	0.713	16.0	196.7	0.419	64	104.3	0.440
0.66	230.2	0.640	16.5	174.6	0.390	66	97.6	0.566
0.68	222.0	0.567	17.0	152.0	0.411	68	93.2	0.684
0.70	211.5	0.501	17.5	133.7	0.475	70	90.1	0.789
0.72	198.1	0.448	18.0	120.4	0.562	72	87.7	0.878
0.74	182.0	0.418	18.5	110.8	0.655	74	85.7	0.947
0.76	164.7	0.418	19.0	103.5	0.743	76	83.9	0.996
0.78	148.6	0.448	19.5	97.7	0.820	78	82.3	1.021
0.80	135.2	0.501	20.0	92.8	0.881	80	80.7	1.026
0.82	124.7	0.567	20.5	88.5	0.924			
0.84	116.5	0.640	21.0	84.5	0.948			
0.86	100.9	0.713	21.5	80.6	0.953			
0.88	104.6	0.782						
0.90	100.1	0.845						
0.92	96.2	0.899						
0.94	92.7	0.942						
0.96	89.4	0.974						
0.98	86.3	0.993						
1.00	83.3	1.000						

The fraction of a revolution is reckoned from the Eastern Elongation.  
Position angle of satellite  $p = p^1 + (P - P_0)$ .  
Apparent distance of satellite  $s = F \frac{a(p)}{p}$ .  
[Eph 15]

Date.	Mimas.		Enceladus.		Tethys.		Dione.	
	$P-P_0$	$\frac{a(\rho)}{\rho}$	$P-P_0$	$\frac{a(\rho)}{\rho}$	$P-P_0$	$\frac{a(\rho)}{\rho}$	$P-P_0$	$\frac{a(\rho)}{\rho}$
	.	"	.	"	.	"	.	"
n. 0	+0.3	31.8	+0.7	40.8	-0.1	50.5	+0.7	64.7
10	0.7	31.6	0.8	40.6	0.0	50.2	0.8	64.3
20	1.0	31.3	0.8	40.2	0.0	49.7	0.9	63.7
30	1.4	30.9	0.9	39.7	+0.1	49.1	0.9	62.9
b. 9	1.7	30.4	0.9	39.1	0.2	48.3	1.0	62.0
19	+2.0	29.9	+1.0	38.4	+0.2	47.5	+1.0	60.9
r. 1	2.2	29.4	0.9	37.7	0.2	46.7	1.0	59.8
11	2.4	28.8	0.9	37.0	0.3	45.8	0.9	58.7
21	2.5	28.3	0.9	36.4	0.3	45.0	0.9	57.6
31	2.6	27.8	0.8	35.7	0.3	44.2	0.9	56.6
r. 10	+2.6	27.3	+0.8	35.1	+0.3	43.4	+0.8	55.7
pt. 17	-2.1	27.4	-0.3	35.2	+0.1	43.5	-0.4	55.8
27	-2.2	27.9	-0.4	35.8	+0.1	44.3	-0.4	56.7
t. 7	2.1	28.4	0.4	36.4	0.2	45.1	0.4	57.8
17	2.0	28.9	0.4	37.1	0.2	45.9	0.5	58.9
27	1.8	29.4	0.4	37.8	0.2	46.8	0.5	59.9
v. 6	1.6	30.0	0.4	38.5	0.3	47.6	0.5	61.0
16	-1.3	30.5	-0.4	39.1	+0.3	48.4	-0.5	62.0
26	1.1	30.9	0.4	39.7	0.3	49.1	0.4	63.0
c. 6	0.8	31.3	0.4	40.2	0.4	49.7	0.4	63.7
16	0.5	31.6	0.4	40.6	0.4	50.2	0.4	64.3
26	-0.2	31.7	-0.3	40.8	+0.5	50.4	-0.4	64.6

Date.	Rhea.		Titan.		Hyperion.		Iapetus.	
	$P-P_0$	$\frac{a(\rho)}{\rho}$	$P-P_0$	$\frac{a(\rho)}{\rho}$	$P-P_0$	$\frac{a(\rho)}{\rho}$	$P-P_0$	$\frac{a(\rho)}{\rho}$
	.	"	.	"	.	"	.	"
n. 0	+1.1	90.4	+0.9	209	+1.0	253	-3.0	610
10	1.1	89.8	1.0	208	1.1	252	3.2	606
20	1.2	89.0	1.0	206	1.2	250	3.3	601
30	1.3	87.9	1.1	204	1.2	247	3.4	593
b. 9	1.3	86.5	1.1	201	1.2	243	3.4	584
19	+1.3	85.1	+1.1	197	+1.3	239	-3.5	574
r. 1	1.3	83.6	1.1	194	1.3	235	3.5	564
11	1.3	82.0	1.1	190	1.2	230	3.4	554
21	1.3	80.5	1.1	187	1.2	226	3.4	544
31	1.2	79.1	1.0	183	1.2	222	3.3	534
r. 10	+1.2	77.7	+1.0	180	+1.1	218	-3.2	525
pt. 17	-0.1	77.9	-0.1	181	-0.1	219	+0.4	526
27	-0.1	79.3	-0.1	184	-0.1	222	+0.6	535
t. 7	0.1	80.7	0.1	187	0.1	226	0.7	545
17	0.1	82.2	0.1	190	0.1	231	0.8	555
27	0.1	83.7	0.1	194	0.1	235	0.8	565
v. 6	0.1	85.2	0.1	198	0.1	239	0.8	575
16	-0.1	86.7	-0.1	201	-0.1	243	+0.7	585
26	0.1	87.9	0.1	204	0.1	247	0.6	594
c. 6	0.1	89.0	0.1	206	0.1	250	0.5	601
16	-0.1	89.8	-0.1	208	-0.1	252	0.4	606
26	0.0	90.3	0.0	209	0.0	253	+0.2	610

APPARENT ORBITS OF THE SATELLITES OF URANUS AT DATE OF OPPOSITION,  
AUGUST 6, 1915, AS SEEN IN AN INVERTING TELESCOPE.

### South

#### Apparent Apries.

Date.	Position Angle.	App. Distances Ariel. Umbriel.
May 20,	352.2	13.5 18.7
Aug 8,	353.0	14.0 19.5
Oct. 27,	353.8	13.4 18.7

#### Apparent Apries.

Date.	Position Angle.	App. Distances Titania. Oberon.
May 20,	352.2	30.7 41.1
Aug. 8,	353.0	32.0 42.8
Oct. 27,	353.8	30.6 40.9

### North

#### WASHINGTON MEAN TIME OF GREATEST ELONGATION.

ARIEL.		UMBRIEL.		TITANIA.		OBERON.
North.	South.	North.	South.	North.	South.	North and South.
d h	d h	d h	d h	d h	d h	d h
May 8 17.1	May 12 11.8	May 1 8.0	May 3 9.7	Apr. 29 7.8	May 3 16.2	May 19 9.0 N.
16 6.6	20 1.3	9 14.9	11 16.6	May 8 0.7	12 9.1	26 2.5 S.
23 20.0	27 14.8	17 21.8	19 23.5	16 17.6	21 2.1	June 1 20.1 N.
31 9.5	June 4 4.2	26 4.7	28 6.4	25 10.5	29 19.0	8 13.6 S.
June 7 22.9	11 17.7	June 3 11.6	June 5 13.3	June 3 3.5	June 7 11.9	15 7.3 N.
15 12.4	19 7.1	11 18.5	13 20.2	11 20.4	16 4.9	22 0.8 S.
23 1.8	26 20.6	20 1.4	22 3.2	20 13.4	24 21.8	28 18.4 N.
30 15.3	July 4 10.1	28 8.4	30 10.1	29 6.3	July 3 14.8	July 5 19.0 S.
July 8 4.8	11 23.5	July 6 15.3	July 8 17.0	July 7 23.3	12 7.8	12 5.6 N.
15 18.2	19 13.0	14 22.2	16 23.9	16 16.2	21 0.7	18 23.3 S.
23 7.7	27 2.5	23 5.1	25 6.9	25 9.2	29 17.7	25 16.8 N.
30 21.2	Aug. 3 16.0	31 12.1	Aug. 2 13.8	Aug. 3 2.2	Aug. 7 10.7	Aug. 1 10.4 S.
Aug. 7 10.7	11 5.4	Aug. 8 19.0	10 20.7	11 19.2	16 3.7	8 4.0 N.
15 0.2	18 18.9	17 2.0	19 3.7	20 12.2	24 20.7	14 21.6 S.
22 13.6	26 8.4	25 8.9	27 10.6	29 5.2	Sept. 2 13.6	21 15.3 N.
30 3.1	Sept. 2 21.9	Sept. 2 15.8	Sept. 4 17.6	Sept. 6 22.1	11 6.6	28 8.8 S.
Sept. 6 16.6	10 11.3	10 22.8	13 0.5	15 15.1	19 23.6	Sept. 4 2.4 N.
14 6.1	18 0.8	19 5.7	21 7.5	24 8.1	28 16.6	10 20.0 S.
21 19.6	25 14.3	27 12.7	29 14.4	Oct. 3 1.1	Oct. 7 9.6	17 13.6 N.
29 9.1	Oct. 3 3.8	Oct. 5 19.6	Oct. 7 21.4	11 18.0	16 2.5	24 7.3 S.
Oct. 6 22.6	10 17.3	14 2.6	16 4.3	20 11.0	24 19.5	Oct. 1 0.8 N.
14 12.0	18 6.8	22 9.5	24 11.2	29 4.0	Nov. 2 12.4	7 18.4 S.
22 1.5	25 20.3	30 16.4	Nov. 1 18.2	Nov. 6 20.9	11 5.4	14 12.0 N.
29 15.0	Nov. 2 9.8	Nov. 7 23.4	10 1.1	15 13.9	19 22.3	21 5.5 S.
Nov. 6 4.5	9 23.2	16 6.3	18 8.0	24 6.8	28 15.3	27 23.1 N.

For Ariel every third elongation is given, and for Umbriel every alternate one; the intermediate ones may be found by adding multiples of the period of the satellite. Sidereal Period of Ariel,  $2^d 12^h .489$ ; of Umbriel,  $4^d 3^h .460$ ; of Titania,  $8^d 16^h .942$ ; of Oberon,  $13^d 11^h .119$ .



Fractions of the Period of Revolution.					Fraction of a Revolution.	$\rho^1$	$F$
Fraction of a Revolution.	Ariel.	Umbriel.	Titania.	Oberon.			
	d h	d h	d h	d h		°	
0.00	0 0.0	0 0.0	0 0.0	0 0.0	0.00	353.0	1.000
0.02	0 1.2	0 2.0	0 4.2	0 6.5	0.02	356.8	0.994
0.04	0 2.4	0 4.0	0 8.4	0 12.9	0.04	0.8	0.977
0.06	0 3.6	0 6.0	0 12.5	0 19.4	0.06	4.9	0.950
0.08	0 4.8	0 8.0	0 16.7	1 1.8	0.08	9.3	0.913
0.10	0 6.0	0 10.0	0 20.9	1 8.3	0.10	14.2	0.868
0.12	0 7.3	0 11.9	1 1.1	1 14.8	0.12	19.6	0.815
0.14	0 8.5	0 13.9	1 5.3	1 21.2	0.14	25.7	0.758
0.16	0 9.7	0 15.9	1 9.4	2 3.7	0.16	33.0	0.700
0.18	0 10.9	0 17.9	1 13.6	2 10.2	0.18	41.6	0.644
0.20	0 12.1	0 19.9	1 17.8	2 16.6	0.20	51.6	0.594
0.22	0 13.3	0 21.9	1 22.0	2 23.1	0.22	63.3	0.556
0.24	0 14.5	0 23.9	2 2.1	3 5.5	0.24	76.3	0.536
0.26	0 15.7	1 1.9	2 6.3	3 12.0	0.26	89.7	0.536
0.28	0 16.9	1 3.8	2 10.5	3 18.5	0.28	102.6	0.556
0.30	0 18.1	1 5.8	2 14.7	4 0.9	0.30	114.3	0.594
0.32	0 19.4	1 7.8	2 18.9	4 7.4	0.32	124.4	0.644
0.34	0 20.6	1 9.8	2 23.0	4 13.9	0.34	132.9	0.700
0.36	0 21.8	1 11.8	3 3.2	4 20.3	0.36	140.2	0.758
0.38	0 23.0	1 13.8	3 7.4	5 2.8	0.38	146.4	0.815
0.40	1 0.2	1 15.8	3 11.6	5 9.2	0.40	151.8	0.868
0.42	1 1.4	1 17.8	3 15.8	5 15.7	0.42	156.6	0.913
0.44	1 2.6	1 19.8	3 19.9	5 22.2	0.44	161.1	0.950
0.46	1 3.8	1 21.8	4 0.1	6 4.6	0.46	165.2	0.977
0.48	1 5.0	1 23.7	4 4.3	6 11.1	0.48	169.1	0.994
0.50	1 6.2	2 1.7	4 8.5	6 17.6	0.50	173.0	1.000
0.52	1 7.5	2 3.7	4 12.6	7 0.0	0.52	176.8	0.994
0.54	1 8.7	2 5.7	4 16.8	7 6.5	0.54	180.8	0.977
0.56	1 9.9	2 7.7	4 21.0	7 12.9	0.56	184.9	0.950
0.58	1 11.1	2 9.7	5 1.2	7 19.4	0.58	189.3	0.913
0.60	1 12.3	2 11.7	5 5.4	8 1.9	0.60	194.2	0.868
0.62	1 13.5	2 13.7	5 9.5	8 8.3	0.62	199.6	0.815
0.64	1 14.7	2 15.7	5 13.7	8 14.8	0.64	205.8	0.758
0.66	1 15.9	2 17.6	5 17.9	8 21.3	0.66	213.0	0.700
0.68	1 17.1	2 19.6	5 22.1	9 3.7	0.68	221.6	0.644
0.70	1 18.3	2 21.6	6 2.3	9 10.2	0.70	231.6	0.594
0.72	1 19.6	2 23.6	6 6.4	9 16.6	0.72	243.3	0.556
0.74	1 20.8	3 1.6	6 10.6	9 23.1	0.74	256.3	0.536
0.76	1 22.0	3 3.6	6 14.8	10 5.6	0.76	269.7	0.536
0.78	1 23.2	3 5.6	6 19.0	10 12.0	0.78	282.7	0.556
0.80	2 0.4	3 7.6	6 23.2	10 18.5	0.80	294.3	0.594
0.82	2 1.6	3 9.6	7 3.3	11 1.0	0.82	304.4	0.644
0.84	2 2.8	3 11.5	7 7.5	11 7.4	0.84	312.9	0.700
0.86	2 4.0	3 13.5	7 11.7	11 13.9	0.86	320.2	0.758
0.88	2 5.2	3 15.5	7 15.9	11 20.3	0.88	326.4	0.815
0.90	2 6.4	3 17.5	7 20.0	12 2.8	0.90	331.8	0.868
0.92	2 7.7	3 19.5	8 0.2	12 9.3	0.92	336.6	0.913
0.94	2 8.9	3 21.5	8 4.4	12 15.7	0.94	341.1	0.950
0.96	2 10.1	3 23.5	8 8.6	12 22.2	0.96	345.2	0.977
0.98	2 11.3	4 1.5	8 12.8	13 4.7	0.98	349.1	0.994
1.00	2 12.5	4 3.5	8 16.9	13 11.1	1.00	353.0	1.000

The fraction of a revolution is reckoned from the Northern Elongation.  
Position angle of satellite  $p = p^1 + (P - P_0)$ .  
Apparent distance of satellite  $s = F \frac{a(p)}{\rho}$ .  
[Eph 15]



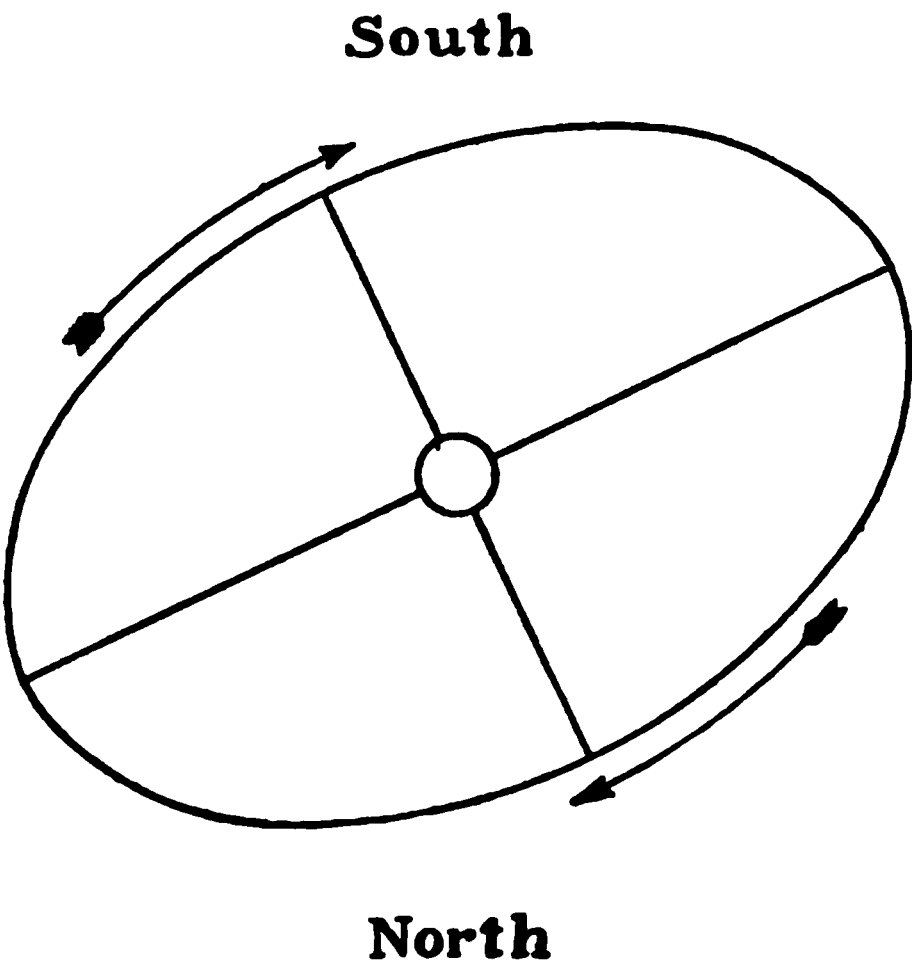
Date.	P-P <sub>0</sub>	$\frac{a(\rho)}{\rho}$				Date.	P-P <sub>0</sub>	$\frac{a(\rho)}{\rho}$			
		Ariel.	Umbriel.	Titania.	Oberon.			Ariel.	Umbriel.	Titania.	Oberon.
	•	"	"	"	"		•	"	"	"	"
Apr. 9	-0.5	13.0	18.2	29.7	39.7	Aug. 7	0.0	13.9	19.6	31.9	42.7
14	0.6	13.0	18.3	29.8	39.9	12	+0.1	13.9	19.6	31.9	42.7
19	0.6	13.1	18.4	29.9	40.0	17	0.2	13.9	19.6	31.9	42.7
24	0.7	13.1	18.5	30.1	40.2	22	0.2	13.9	19.6	31.9	42.6
29	0.7	13.2	18.5	30.2	40.4	27	0.3	13.9	19.5	31.8	42.6
May 4	-0.8	13.2	18.6	30.3	40.5	Sept. 1	+0.4	13.9	19.5	31.8	42.5
9	0.8	13.3	18.7	30.4	40.7	6	0.4	13.8	19.5	31.7	42.4
14	0.8	13.3	18.8	30.6	40.9	11	0.5	13.8	19.4	31.6	42.3
19	0.8	13.4	18.8	30.7	41.0	16	0.6	13.8	19.4	31.5	42.2
24	0.8	13.4	18.9	30.8	41.2	21	0.6	13.7	19.3	31.5	42.0
29	-0.8	13.5	19.0	31.0	41.4	26	+0.7	13.7	19.2	31.4	41.9
June 3	0.8	13.6	19.1	31.1	41.5	Oct. 1	0.7	13.6	19.2	31.2	41.8
8	0.7	13.6	19.1	31.2	41.7	6	0.7	13.6	19.1	31.1	41.6
13	0.7	13.6	19.2	31.3	41.9	11	0.8	13.5	19.0	31.0	41.4
18	0.7	13.7	19.3	31.4	42.0	16	0.8	13.5	18.9	30.9	41.3
23	-0.6	13.7	19.3	31.5	42.1	21	+0.8	13.4	18.9	30.7	41.1
28	0.6	13.8	19.4	31.6	42.2	26	0.8	13.3	18.8	30.6	40.9
July 3	0.5	13.8	19.4	31.7	42.4	31	0.8	13.3	18.7	30.5	40.7
8	0.4	13.8	19.5	31.7	42.5	Nov. 5	0.8	13.2	18.6	30.3	40.6
13	0.4	13.9	19.5	31.8	42.5	10	0.7	13.2	18.5	30.2	40.4
18	-0.3	13.9	19.6	31.9	42.6	15	+0.7	13.1	18.5	30.1	40.2
23	0.2	13.9	19.6	31.9	42.7	20	0.6	13.1	18.4	30.0	40.1
28	0.2	13.9	19.6	31.9	42.7	25	0.6	13.0	18.3	29.8	39.9
Aug. 2	-0.1	13.9	19.6	32.0	42.7	30	+0.5	13.0	18.2	29.7	39.7

SATELLITE OF NEPTUNE, 1915.

Time from Eastern Elongation.			F	Time from Eastern Elongation.			F	Date.	P-P <sub>0</sub>	$\frac{a(\rho)}{\rho}$	Date.	P-P <sub>0</sub>	$\frac{a(\rho)}{\rho}$
d	h	$\rho^1$		d	h	$\rho^1$							
0	0	115.2	1.000	3	0	292.7	0.999	Jan. 0	+0.6	16.8	Apr. 30	-1.6	16.2
0	3	110.2	0.995	3	3	287.8	0.988	5	0.5	16.8	May 5	1.5	16.2
0	6	105.2	0.979	3	6	282.6	0.968	10	0.3	16.9	10	1.4	16.1
0	9	99.9	0.954	3	9	277.2	0.939	15	+0.2	16.9	15	-1.3	16.1
0	12	94.3	0.921	3	12	271.4	0.902	20	0.0	16.9	Sept. 27	+3.6	16.1
0	15	88.2	0.881	3	15	265.0	0.859	25	-0.2	16.9	Oct. 2	+3.7	16.1
0	18	81.5	0.836	3	18	257.9	0.812	30	0.4	16.8	7	3.8	16.1
0	21	74.0	0.788	3	21	250.0	0.765	Feb. 4	0.5	16.8	12	3.9	16.2
1	0	65.5	0.742	4	0	241.0	0.721	9	0.7	16.8	17	4.0	16.2
1	3	56.0	0.701	4	3	231.0	0.684	14	0.8	16.8	22	4.0	16.3
1	6	45.5	0.669	4	6	220.0	0.658	19	-1.0	16.8	27	+4.1	16.3
1	9	34.1	0.649	4	9	208.3	0.645	24	1.1	16.7	Nov. 1	4.1	16.4
1	12	22.2	0.645	4	12	196.4	0.649	Mar. 1	1.2	16.7	6	4.1	16.4
1	15	10.6	0.657	4	15	185.0	0.669	6	1.3	16.7	11	4.1	16.5
1	18	359.5	0.683	4	18	174.4	0.701	11	1.4	16.6	16	4.1	16.5
1	21	349.5	0.721	4	21	164.9	0.742	16	-1.5	16.6	21	+4.0	16.5
2	0	340.5	0.765	5	0	156.5	0.788	21	1.6	16.6	26	4.0	16.6
2	3	332.6	0.812	5	3	149.0	0.835	26	1.6	16.5	Dec. 1	3.9	16.6
2	6	325.5	0.858	5	6	142.3	0.880	31	1.7	16.5	6	3.8	16.7
2	9	319.1	0.901	5	9	136.2	0.921	Apr. 5	1.7	16.4	11	3.7	16.7
2	12	313.3	0.939	5	12	130.5	0.954	10	-1.7	16.4	16	+3.6	16.7
2	15	307.8	0.968	5	15	125.3	0.979	15	1.7	16.3	21	3.5	16.8
2	18	302.7	0.988	5	18	120.2	0.995	20	1.7	16.3	26	3.3	16.8
2	21	297.7	0.999	5	21	115.3	1.000	25	-1.6	16.2	31	+3.2	16.8

Position angle of satellite  $\rho = \rho^1 + (P - P_0)$ .  
Apparent distance of satellite  $s = F \frac{a(\rho)}{\rho}$ .

APPARENT ORBIT OF THE SATELLITE OF NEPTUNE AT DATE OF OPPOSITION,  
JANUARY 19, 1915. AS SEEN IN AN INVERTING TELESCOPE.



Date.	Position Angle of Apsis.	Apparent Distance at Apsis.
Jan. 20	115.2	16.8
Apr. 10	113.5	16.3
Oct. 7	119.0	16.1
Dec. 26	118.5	16.7

WASHINGTON MEAN TIME OF GREATEST ELONGATION.

East.	West.	East.	West.	East.	West.
Jan. d h 4 3.8 10 0.9 15 22.0 21 19.2 27 16.3	Jan. d h 7 2.3 12 23.5 18 20.6 24 17.7 30 14.8	Mar. d h 27 11.4 Apr. 2 8.5 8 5.5 14 2.6 19 23.6	Mar. d h 30 9.9 Apr. 5 7.0 11 4.0 17 1.1 22 22.1	Oct. d h 13 4.6 19 1.6 24 22.6 30 19.6 Nov. 5 16.6	Oct. d h 16 3.1 22 0.1 27 21.1 Nov. 2 18.1 8 15.1
Feb. d h 2 13.4 8 10.5 14 7.6 20 4.8 26 1.9	Feb. d h 5 12.0 11 9.1 17 6.2 23 3.3 Mar. 1 0.4	May d h 25 20.6 1 17.7 7 14.7 13 11.7 19 8.7	May d h 28 19.2 4 16.2 10 13.2 16 10.2 22 7.2	11 13.7 17 10.7 23 7.8 29 4.8 Dec. 5 1.9	14 12.2 20 9.2 26 6.3 Dec. 2 3.4 8 0.4
Mar. d h 3 23.0 9 20.1 15 17.2 21 14.3	6 21.6 12 18.7 18 15.8 24 12.8	Sept. . . . . 25 13.6 Oct. 1 10.6 7 7.6	Sept. . . . . 28 12.1 Oct. 4 9.1 10 6.1	10 23.0 16 20.1 22 17.2 28 14.3	13 21.5 19 18.6 25 15.7 31 12.8

The above times are the instants of each passage of the satellite through the apsis of its apparent orbit. The position of the satellite at any other time may be found by measuring around the orbit from the apsis last passed through, bearing in mind that the radius vector of the satellite describes equal areas in equal times.

The sidereal period of the satellite of Neptune is 5<sup>d</sup> 21<sup>h</sup>.044.

*NOTE.*—In the preceding diagrams the central circle represents the planet and is on the same scale as the orbits.

[Eph 15]



WASHINGTON MEAN TIME.

PLANET

RATIONS.

1  
1  
1  
1

1

1  
1  
1  
1

1

1  
1  
1

1  
1

1

No.	PLACE	Geographic Latitude.	Reduction to Geocentric Latitude.	Altitude (Meters).	Log $\rho$ (Including altitude).	Longitude from Washington.
		° ' "	' "			h m s
1	Abbadia, France . . .	+43 22 52.2	-11 34.4	69	9.999 317	- 5 1 15.7
2	Adelaide . . . . .	-34 55 38	+10 52.4	43	9.999 526	+ 9 37 23.02
3	Albany, N. Y . . . .	+42 39 12.7	-11 33.1	67	9.999 336	- 0 13 9.0
4	Algiers . . . . .	+36 47 50	-11 6.7	342	9.999 501	- 5 20 24.33
5	Allegheny, Pa . . . .	+40 28 58.0	-11 26.7	384	9.999 412	+ 0 11 49.61
6	Amherst, Mass. . . .	+42 21 56.5	-11 32.5	110	9.999 346	- 0 18 9.85
7	Ann Arbor, Mich. . .	+42 16 48.0	-11 32.3	285	9.999 360	+ 0 26 39.41
8	Appleton, Wis. . . .	+44 15 39	-11 35.4	238	9.999 306	+ 0 45 20.11
9	Arcetri, Italy . . . .	+43 45 14.6	-11 34.9	184	9.999 316	- 5 53 17.12
10	Arequipa, Peru . . .	-16 22 28.0	+ 6 15.2	2452	0.000 052	- 0 22 4.05
11	Armagh, Ireland . . .	+54 21 12.7	-10 59.6	61	9.999 040	- 4 41 40.4
12	Athens . . . . .	+37 58 19.7	-11 14.3	107	9.999 456	- 6 43 8.70
13	Baltimore, Md. . . .	+39 17 48	-11 21.5	75	9.999 421	- 0 1 49.8
14	Bamberg, Bavaria . .	+49 53 6.0	-11 26.0	300	9.999 167	- 5 51 49.43
15	Barcelona, Spain . . .	+41 25 18	-11 30.0	420	9.999 391	- 5 16 43.8
16	Bayswater . . . . .	-31 55 13	+10 23.5	30	9.999 596	+11 8 6
17	Beloit, Wis. . . . .	+42 30 8.4	-11 32.8	. . .	9.999 335	+ 0 47 51.5
18	Bergen, Norway . . .	+60 23 54	- 9 58.6	. . .	9.998 895	- 5 29 28.53
19	Berkeley, Cal. . . .	+37 52 23.6	-11 13.7	97	9.999 458	+ 3 0 46.94
20	Berlin, Prussia . . .	+52 30 16.7	-11 12.5	47	9.999 085	- 6 1 50.63
21	Berlin, Prussia . . .	+52 31 30.7	-11 12.4	. . .	9.999 081	- 6 1 43.33
22	Berlin, Prussia . . .	+52 29 7	-11 12.6	38	9.999 084	- 6 2 10.0
23	Berne, Switzerland . .	+46 57 8.7	-11 34.2	573	9.999 260	- 5 38 1.51
24	. . . . .	+47 14 59.0	-11 33.7	310	9.999 235	- 5 32 12.05
25	Pa. . . . .	+40 36 23.1	-11 27.2	. . .	9.999 383	- 0 6 43.93
26	Birr Castle, Ireland .	+53 5 47.0	-11 8.7	56	9.999 071	- 4 36 34.9
27	Ind. . . . .	+39 9 54	-11 20.8	266	9.999 437	+ 0 38 38
28	Bogota . . . . .	+ 4 36 15.4	- 1 51.0	2634	0.000 170	- 0 11 21.58
29	Bombay, India . . . .	+18 53 45	- 7 5.2	19	9.999 849	- 9 59 31.52
30	Bonn, Prussia . . . .	+50 43 45.0	-11 22.3	62	9.999 130	- 5 36 39.00
31	. . . . .	+44 50 7.2	-11 35.6	73	9.999 281	- 5 6 10.24
32	. . . . .	+42 20 58	-11 32.5	. . .	9.999 339	- 0 23 56.7
33	. . . . .	+54 12 9.6	-11 0.8	32	9.999 042	- 5 48 47.0
34	. . . . .	+53 4 36	-11 8.8	. . .	9.999 067	- 5 43 31.7
35	Breslau, Prussia . . .	+51 6 55.8	-11 20.4	147	9.999 126	- 6 16 24.57
36	Brisbane . . . . .	-27 28 0	+ 9 28.3	. . .	9.999 691	+ 8 39 37.8
37	Brussels, Belgium . .	+50 47 55.5	-11 21.9	100	9.999 131	- 5 25 42.7
38	Budapest, Hungary . .	+47 29 34.7	-11 33.2	. . .	9.999 208	- 6 24 31.1
39	Eng. . . . .	+52 12 51.6	-11 14.3	26	9.999 090	- 5 8 38.53
40	Mass . . . . .	+42 22 47.6	-11 32.6	24	9.999 340	- 0 23 44.73
41	Hope . . . . .	-33 56 3.6	+10 43.6	16	9.999 548	- 6 22 10.54
42	Carloforte . . . . .	+39 8 9	-11 20.8	18	9.999 421	- 5 41 30.7
43	Catania, Sicily . . . .	+37 30 13.3	-11 11.4	47	9.999 464	- 6 8 36
44	Charkow, Russia . . .	+50 0 9.6	-11 25.5	138	9.999 153	- 7 33 11.55
45	Charlottesville, Va. .	+38 2 1.2	-11 14.6	250	9.999 464	+ 0 5 49.44

No.	LONGITUDE FROM GREENWICH.		Reduction from Gr. Sid. Time of Mean Noon to Local S. T. M. N.	DESCRIPTION.
	In Time.	In Arc.		
	h m s	° ' "	s	
1	+ 0 7 0.1	+ 1 45 1.5	+ 1.15	Obs. Paris Academy of Science, Hendaye.
2	− 9 14 20.30	− 138 35 4.5	− 91.06	South Australia.
3	+ 4 55 6.8	+ 73 46 42.0	+ 48.48	Dudley Obs. Old Obs. 36'' .8 N., 6° .79 E.
4	− 0 12 8.55	− 3 2 8.2	− 2.00	At Bouzaréah, near Algiers. Old Obs. 3' .8 S., 8° E.
5	+ 5 20 5.39	+ 80 1 20.8	+ 52.58	Univ. of Pittsburgh. Old Obs., 76'' .4 S., 2° .46 E.
6	+ 4 50 5.93	+ 72 31 29.0	+ 47.66	Amherst College Obs. Old Obs. 20'' .6 N., 1° .26 E.
7	+ 5 34 55.19	+ 83 43 47.8	+ 55.02	Detroit Obs. of the University of Michigan.
8	+ 5 53 35.89	+ 88 23 58.4	+ 58.09	Underwood Obs. of the Lawrence University.
9	− 0 45 1.34	− 11 15 20.1	− 7.40	Near Florence.
10	+ 4 46 11.73	+ 71 32 56.0	+ 47.02	Branch of the Harvard College Observatory.
11	+ 0 26 35.4	+ 6 38 51.0	+ 4.37	University Observatory.
12	− 1 34 52.92	− 23 43 13.8	− 15.59	National Observatory of Greece.
13	+ 5 6 26.0	+ 76 36 30	+ 50.34	Johns Hopkins University Observatory.
14	− 0 43 33.65	− 10 53 24.8	− 7.16	Remeis Observatory.
15	− 0 8 28.0	− 2 7 0	− 1.39	Fabra Obs. of the Royal Acad. of Sci. and Arts.
16	− 7 43 38	− 115 54 30	− 76.16	International Latitude Obs. West Australia.
17	+ 5 56 7.3	+ 89 1 49.5	+ 58.50	Smith Observatory of Beloit College.
18	− 0 21 12.75	− 5 18 11.2	− 3.48	Observatory of Naval School.
19	+ 8 9 2.72	+ 122 15 40.8	+ 80.34	Student's Obs. of the University of California.
20	− 0 53 34.85	− 13 23 42.8	− 8.80	Royal Obs. Old Obs. 56'' .4 N., 0° .39 W.
21	− 0 53 27.45	− 13 21 51.8	− 8.78	Urania Observatory.
22	− 0 53 54.2	− 13 28 33	− 8.86	Treptow Observatory.
23	− 0 29 45.73	− 7 26 26.0	− 4.89	Observatory of the Cantonal University.
24	− 0 23 57.17	− 5 59 17.6	− 3.94	National Observatory.
25	+ 5 1 31.85	+ 75 22 57.8	+ 49.53	Sayre Obs. of Lehigh Univ. at South Bethlehem.
26	+ 0 31 40.9	+ 7 55 13.5	+ 5.20	Private observatory of the Earl of Rosse.
27	+ 5 46 54	+ 86 43 30	+ 56.99	Kirkwood Obs. of the University of Indiana.
28	+ 4 56 54.20	+ 74 13 33.0	+ 48.77	National Obs. of the Republic of Colombia.
29	− 4 51 15.74	− 72 48 56.1	− 47.85	Government Obs. Colaba.
30	− 0 28 23.22	− 7 5 48.3	− 4.66	Royal University Observatory.
31	+ 0 2 5.54	+ 0 31 23.1	+ 0.34	Observatory, Univ. of Bordeaux at Floirac.
32	+ 4 44 19.1	+ 71 4 46.5	+ 46.71	Obs. of Boston Univ. Old Obs. 34'' N., 4° .1 E.
33	− 0 40 31.2	− 10 7 48.0	− 6.66	Observatory of Herr. von Bülow.
34	− 0 35 15.9	− 8 48 58.5	− 5.79	Formerly Olber's Observatory.
35	− 1 8 8.79	− 17 2 11.8	− 11.20	Royal University Observatory.
36	− 10 12 6.4	− 153 1 36	− 100.55	Queensland, Australia.
37	− 0 17 26.9	− 4 21 43.5	− 2.87	Royal Obs. of Belgium. Old Obs. 3' 18'' N., 1° .8 E.
38	− 1 16 15.3	− 19 3 49.5	− 12.53	University Observatory.
39	− 0 0 22.75	− 0 5 41.2	− 0.06	University of Cambridge Observatory.
40	+ 4 44 31.05	+ 71 7 45.8	+ 46.74	Harvard College Observatory.
41	− 1 13 54.76	− 18 28 41.4	− 12.14	Royal Observatory.
42	− 0 33 14.9	− 8 18 43.5	− 5.46	Internat. Lat. Obs., Sardinia.
43	− 1 0 20	− 15 5 0	− 9.91	Royal Astrophysical Obs. of the University.
44	− 2 24 55.77	− 36 13 56.6	− 23.81	University Observatory.
45	+ 5 14 5.22	+ 78 31 18.3	+ 51.60	Leander McCormick Obs. of Univ. of Virginia.

No.	PLACE.	Geographic Latitude.	Reduction to Geocentric Latitude.	Altitude (Meters).	Log $\rho$ (Including altitude).	Longitude from Washington.
		° ' "	' "			h m s
46	Chicago, Ill. . .	+41 50 1.0	-11 31.2	. . .	9.999 352	+ 0 42 11.06
47	Christiania, Norway	+59 54 44.0	-10 4.6	25	9.998 908	- 5 51 9.30
48	Cincinnati, Ohio .	+39 8 19.5	-11 20.7	249	9.999 437	+ 0 29 25.62
49	Cleveland, Ohio .	+41 30 14.5	-11 30.2	212	9.999 375	+ 0 18 10.04
50	Clinton, N. Y. . .	+43 3 17.0	-11 33.9	276	9.999 340	- 0 6 38.33
51	Coimbra, Portugal	+40 12 24.5	-11 25.6	99	9.999 400	- 4 34 32.7
52	Columbia, Mo. . .	+38 56 51.7	-11 19.7	225	9.999 440	+ 1 1 2.55
53	Columbus, Ohio .	+39 59 50.4	-11 24.7	. . .	9.999 398	+ 0 23 46.8
54	Copenhagen . . .	+55 41 12.6	-10 48.6	14	9.999 005	- 5 58 34.48
55	Cordoba . . . .	-31 25 15.2	+10 18.0	434	9.999 634	- 0 51 27.56
56	Cracow, Austria .	+50 3 52.0	-11 25.2	220	9.999 157	- 6 28 6.06
57	Dantzic . . . .	+54 21 18.0	-10 59.6	3	9.999 036	- 6 22 55.4
58	Dehra Dun, India .	+30 18 51.8	-10 5.3	687	9.999 676	-10 20 29.25
59	Denver, Colo. . .	+39 40 36.4	-11 23.3	1650	9.999 519	+ 1 51 31.85
60	Des Moines, Iowa .	+41 36 0	-11 30.5	296	9.999 378	+ 1 6 14.78
61	Dorpat, Russia .	+58 22 47.1	-10 22.1	65	9.998 945	- 6 55 9.07
62	Dresden, Saxony .	+51 2 16.8	-11 20.8	. . .	9.999 118	- 6 3 10.63
63	Dublin, Ireland .	+53 23 13.1	-11 6.7	86	9.999 066	- 4 42 54.7
64	Dun Echt, Scotland	+57 9 36	-10 34.8	141	9.998 979	- 4 58 35.8
65	Durham, England	+54 46 6.2	-10 56.4	107	9.999 033	- 5 1 56.03
66	Düsseldorf, Prussia	+51 12 25.0	-11 19.9	26	9.999 115	- 5 35 20.8
67	Edinburgh, Scotland	+55 55 28.0	-10 46.5	134	9.999 007	- 4 55 31.6
68	Edinburgh, Scotland	+55 57 23.2	-10 46.2	106	9.998 995	- 4 55 32.7
69	Elmira, N. Y. . .	+42 6 25	-11 31.9	. . .	9.999 345	- 0 1 1.88
70	Evanston, Ill. . .	+42 3 33.4	-11 31.8	175	9.999 358	+ 0 42 26.5
71	Flagstaff, Ariz. .	+35 12 30.4	-10 54.7	2210	9.999 667	+ 2 18 28.79
72	Gaithersburg, Md.	+39 8 13.2	-11 20.7	165	9.999 431	+ 0 0 31.95
73	Geneva, N. Y. . .	+42 52 46.2	-11 33.6	152	9.999 336	- 0 0 14.78
74	Geneva, Switzerland	+46 11 58.8	-11 35.2	406	9.999 268	- 5 32 52.49
75	Genoa, Italy . . .	+44 25 9.3	-11 35.5	105	9.999 293	- 5 43 57.11
76	Georgetown, D. C.	+38 54 26.7	-11 19.5	46	9.999 429	+ 0 0 2.48
77	Glasgow, Mo. . .	+39 13 45.6	-11 21.1	227	9.999 433	+ 1 3 2.30
78	Glasgow, Scotland	+55 52 42.8	-10 46.9	55	9.999 003	- 4 51 5.23
79	Gotha, Germany .	+50 56 37.9	-11 21.2	320	9.999 142	- 5 51 6.27
80	Göttingen, Prussia	+51 31 47.9	-11 18.2	160	9.999 116	- 5 48 2.07
81	Greencastle, Ind. .	+39 38 46.6	-11 23.1	262	9.999 425	+ 0 39 8.56
82	Greenwich, England	+51 28 38.1	-11 18.5	47	9.999 110	- 5 8 15.78
83	Hamburg, Germany	+53 28 46.0	-11 6.1	40	9.999 060	- 5 49 14.3
84	Hamburg, Germany	+53 33 7.0	-11 5.6	25	9.999 057	- 5 48 9.6
85	Hamburg, Germany	+53 32 51.8	-11 5.6	30	9.999 058	- 5 48 9.20
86	Hanover, N. H. .	+43 42 15.3	-11 34.8	183	9.999 317	- 0 19 7.87
87	Haverford, Pa. .	+40 0 40.1	-11 24.8	. . .	9.999 398	- 0 7 3.08
88	Heidelberg, Baden	+49 23 55.2	-11 27.8	570	9.999 198	- 5 43 8.91
89	Heidelberg, Baden	+49 23 54.9	-11 27.8	562	9.999 198	- 5 43 10.03
90	Helsingfors, Finland	+60 9 42.6	-10 1.5	38	9.998 903	- 6 48 4.93
91	Herény, Hungary .	+47 15 47.4	-11 33.7	229	9.999 229	- 6 14 40.5

LONGITUDE FROM GREENWICH.			Reduction from Gr. Sid. Time of Mean Noon to Local S. T. M. N.	DESCRIPTION.
In Time.	In Arc.			
h m s	° ' "	s		
5 50 26.84	+ 87 36 42.6	+57.57	Old Obs.; transferred to Evanston, Ill., in 1887.	
5 42 53.52	− 10 43 22.8	− 7.05	Observatory of the University.	
5 37 41.40	+ 84 25 21.0	+55.48	Univ.Obs.on Mt.Lookout.Old Obs.1'53''S.17°.6W.	
5 26 25.82	+ 81 36 27.3	+53.62	Obs. of Case School of Applied Science.	
5 1 37.45	+ 75 24 21.7	+49.55	Litchfield Obs. of Hamilton College.	
5 33 43.1	+ 8 25 46.5	+ 5.54	Royal Astronomical Observatory of Portugal.	
5 9 18.33	+ 92 19 35.0	+60.67	Laws Observatory of the University of Missouri.	
5 32 2.6	+ 83 0 39.0	+54.55	Emerson McMillan Obs. of Ohio State Univ.	
5 50 18.70	− 12 34 40.5	− 8.26	University Observatory, Denmark.	
4 16 48.22	+ 64 12 3.3	+42.19	National Observatory of Argentine Republic.	
1 19 50.28	− 19 57 34.2	−13.12	Royal University Observatory.	
1 14 39.6	− 18 39 54.0	−12.26	Western Prussia.	
5 12 13.47	− 78 3 22.0	−51.29	Obs. Great Trigonometric Survey of India.	
5 59 47.63	+104 56 54.4	+68.96	Chamberlin Observatory of the Univ. of Denver.	
5 14 30.56	+ 93 37 38.4	+61.52	Drake University Observatory.	
1 46 53.29	− 26 43 19.3	−17.56	Observatory Imperial University (Jurjew).	
5 54 54.85	− 13 43 42.7	− 9.02	Baron Engelhardt's Observatory.	
5 25 21.1	+ 6 20 16.5	+ 4.16	Observatory of Trinity College at Dunsink.	
5 9 40.0	+ 2 25 0.0	+ 1.59	Formerly Lord Crawford's Observatory.	
5 6 19.75	+ 1 34 56.3	+ 1.04	Observatory of the University.	
5 27 5.0	− 6 46 15.0	− 4.45	Municipal Observatory, Bilk.	
5 12 44.2	+ 3 11 3.0	+ 2.09	Royal Obs. of Scotland, Blackford Hill.	
5 12 43.1	+ 3 10 46.5	+ 2.09	City Observatory, Calton Hill.	
5 7 13.90	+ 76 48 28.5	+50.47	Elmira College Observatory.	
5 50 42.3	+ 87 40 34.5	+57.61	Dearborn Observatory of North Western Univ.	
7 26 44.57	+111 41 8.6	+73.39	Lowell Observatory.	
5 8 47.73	+ 77 11 56.0	+50.73	International Latitude Observatory.	
5 8 1.00	+ 77 0 15.0	+50.60	Smith Observatory.	
5 24 36.71	− 6 9 10.7	− 4.04	Municipal Observatory.	
5 35 41.33	− 8 55 20.0	− 5.86	Hydrographic Institute.	
5 8 18.26	+ 77 4 33.9	+50.65	Georgetown College Observatory, Washington.	
5 11 18.08	+ 92 49 31.2	+61.00	Morrison Observatory.	
5 17 10.55	+ 4 17 38.3	+ 2.82	University Observatory.	
5 42 50.49	− 10 42 37.3	− 7.04	Ducal Observatory, Saxe-Coburg-Gotha.	
5 39 46.29	− 9 56 34.3	− 6.53	Royal University Observatory.	
5 47 24.34	+ 86 51 5.1	+57.07	McKim Observatory of De Pauw University.	
5 0 0.00	0 0 0.0	0.00	Royal Observatory.	
5 40 58.5	− 10 14 37.5	− 6.73	New Observatory, Bergedorf.	
5 39 53.8	− 9 58 27.0	− 6.55	Old Observatory.	
5 39 53.42	− 9 58 21.3	− 6.55	Imperial Marine Observatory.	
4 49 7.91	+ 72 16 58.7	+47.50	Shattuck Observatory of Dartmouth College.	
5 1 12.70	+ 75 18 10.5	+49.48	Haverford College Observatory.	
5 34 53.13	− 8 43 17.0	− 5.73	Astronomical Institute, Königstuhl.	
5 34 54.25	− 8 43 33.7	− 5.73	Astrophysical Institute, Königstuhl.	
5 39 49.15	− 24 57 17.3	−16.40	University Observatory.	
5 6 24.7	− 16 36 10.5	−10.91	Astrophysical Obs., near Steinamanger.	



No.	PLACE.	Geographic Latitude.	Reduction to Geocentric Latitude.	Alti- tude (Meters).	Log $\rho$ (Including altitude).	Longitude from Washington.
		° ' "	' "			h m s
92	Hong Kong, China	+22 18 13.4	- 8 7.4	34	9.999 793	+11 15 2.36
93	Iowa City, Iowa .	+41 40 0	-11 30.7	183	9.999 369	+ 0 57 50
94	Ithaca, N. Y. . .	+42 26 47.3	-11 32.6	256	9.999 354	- 0 2 19.79
95	Jamaica, West Indies	+18 24 51	- 6 55.9	. . .	9.999 855	+ 0 3 13.70
96	Jena, Saxe-Weimar	+50 55 34.9	-11 21.3	156	9.999 131	- 5 54 36.05
97	Jena, Saxe-Weimar	+50 56 11.0	-11 21.3	174	9.999 132	- 5 54 36.56
98	Johannesburg . .	-26 10 54.5	+ 9 9.8	1806	9.999 840	- 7 0 33.8
99	Kalocsa . . . .	+46 31 41.7	-11 34.8	117	9.999 240	- 6 24 10.12
100	Kasan, Russia . .	+55 50 20.0	-10 47.3	98	9.999 007	- 8 23 32.3
101	Kasan, Russia . .	+55 47 24.3	-10 47.7	79	9.999 007	- 8 24 44.82
102	Kew, Eng. . . .	+51 28 6	-11 18.5	11	9.999 108	- 5 7 0.7
103	Kief, Russia . .	+50 27 10.5	-11 23.5	182	9.999 145	- 7 10 16.42
104	Kiel, Prussia . .	+54 20 27.6	-10 59.7	48	9.999 040	- 5 48 51.33
105	Kis-Kartal . . .	+47 41 54.8	-11 32.8	. . .	9.999 202	- 6 26 27.5
106	Königsberg, Prussia	+54 42 50.4	-10 56.8	22	9.999 029	- 6 30 14.82
107	Kremsmünster . .	+48 3 23.1	-11 32.0	384	9.999 220	- 6 4 47.37
108	La Plata . . . .	-34 54 30.3	+10 52.2	12	9.999 524	- 1 16 38.8
109	Lawrence, Kansas	+38 57 26	-11 7.8	311	9.999 495	+ 1 12 42
110	Leiden, Netherlands	+52 9 20.0	-11 14.6	4	9.999 090	- 5 26 11.95
111	Leipzig, Saxony .	+51 20 5.9	-11 19.2	119	9.999 118	- 5 57 49.76
112	Liège, Belgium .	+50 37 7	-11 22.8	127	9.999 137	- 5 30 31.0
113	Lisbon, Portugal .	+38 42 30.5	-11 18.5	94	9.999 437	- 4 31 31.10
114	Liverpool, Eng. .	+53 24 4.8	-11 6.6	62	9.999 064	- 4 55 58.45
115	Lund, Sweden . .	+55 41 51.6	-10 48.5	38	9.999 006	- 6 1 0.79
116	Lussinpiccolo . .	+44 32 11.0	-11 35.5	42	9.999 286	- 6 6 8.19
117	Lyons, France . .	+45 41 41.0	-11 35.5	300	9.999 274	- 5 27 24.33
118	Madison, Wis. . .	+43 4 36.8	-11 33.9	292	9.999 340	+ 0 49 22.15
119	Madras, India . .	+13 4 8.0	- 5 5.5	7	9.999 926	-10 29 14.90
120	Madrid, Spain . .	+40 24 29.7	-11 26.4	655	9.999 433	- 4 53 30.66
121	Manila, P. I. . .	+14 35 25	- 5 38.2	3	9.999 908	+10 47 54
122	Mare Island, Cal. .	+38 5 55.8	-11 15.0	22	9.999 447	+ 3 0 49.8
123	Markree, Ireland .	+54 10 31.8	-11 1.0	45	9.999 044	- 4 34 27.4
124	Marseilles, France .	+43 18 17.5	-11 34.3	75	9.999 320	- 5 29 50.37
125	Mauritius . . . .	-20 5 39	+ 7 27.7	55	9.999 832	- 8 58 28.4
126	Melbourne, Victoria	-37 49 53.4	+11 13.4	28	9.999 454	+ 9 11 50.2
127	Meudon, France .	+48 48 18	-11 29.8	162	9.999 185	- 5 17 11.4
128	Middletown, Conn.	+41 33 16.0	-11 30.4	. . .	9.999 359	- 0 17 38.60
129	Milan, Italy . . .	+45 27 59.3	-11 35.6	120	9.999 268	- 5 45 1.70
130	Minneapolis, Minn.	+44 58 40.0	-11 35.7	260	9.999 290	+ 1 4 41.06
131	Mizusawa, Japan .	+39 8 3.6	-11 20.7	62	9.999 424	+ 9 27 13.47
132	Modena, Italy . .	+44 38 52.8	-11 35.6	. . .	9.999 280	- 5 51 58.7
133	Montreal, Canada .	+45 30 17.0	-11 35.6	67	9.999 263	- 0 13 57.15
134	Moscow, Russia .	+55 45 19.8	-10 48.0	150	9.999 012	- 7 38 32.87
135	Mount Hamilton .	+37 20 25.6	-11 10.4	1283	9.999 552	+ 2 58 19.11
136	Mount Wilson . .	+34 12 59.5	-10 46.2	1800	9.999 663	+ 2 43 58.55

LONGITUDE FROM GREENWICH.			Reduction from Gr. Sid. Time of Mean Noon to Local S. T. M. N.	DESCRIPTION.
In Time.		In Arc.		
h m s	° ' "	s		
-7 36 41.86	-114 10 27.9	-75.01		British Colonial Observatory.
+6 6 6	+ 91 31 30	+60.14		Obs. of the State Univ. of Iowa.
+5 5 55.99	+ 76 28 59.9	+50.26		Observatory of Cornell University.
+5 11 29.48	+ 77 52 22.2	+51.17		Mr. Hall's Observatory, Montego Bay.
-0 46 20.27	- 11 35 4.0	- 7.61		University Observatory.
-0 46 20.78	- 11 35 11.7	- 7.61		The late Dr. Winkler's Observatory.
-1 52 18.0	- 28 4 30.0	-18.45		Union Observatory, Transvaal.
-1 15 54.34	- 18 58 35.1	-12.47		Haynald Obs., Hungary.
-3 15 16.5	- 48 49 7.5	-32.08		Englehardt Observatory.
-3 16 29.04	- 49 7 15.6	-32.28		Imperial Univ. Observatory.
+0 1 15.1	+ 0 18 46.5	+ 0.21		Meteorological Obs., Kew Gardens, London.
-2 2 0.64	- 30 30 9.6	-20.04		Imperial University Observatory.
-0 40 35.55	- 10 8 53.3	- 6.67		Old position of Transit Circle, $\sigma''$ .9 N., $\sigma^s$ .12 E.
-1 18 11.7	- 19 32 55.5	-12.85		Near Aszód, Hungary.
-1 21 59.04	- 20 29 45.6	-13.47		Royal University Observatory.
-0 56 31.59	- 14 7 53.9	- 9.29		Obs. of the Benedictines, Austria.
+3 51 37.0	+ 57 54 15.0	+38.05		Obs. National Univ., Argentine Republic.
+6 20 58	+ 95 14 30	+62.58		Obs. of the State Univ. of Kansas.
-0 17 56.17	- 4 29 2.6	- 2.95		University Observatory.
-0 49 33.98	- 12 23 29.7	- 8.14		University Observatory.
-0 22 15.2	- 5 33 48.0	- 3.66		University Observatory, Cointe.
+0 36 44.68	+ 9 11 10.2	+ 6.04		Royal Astronomical Obs., Tapada.
+0 12 17.33	+ 3 4 20.0	+ 2.02		Bidston, Birkenhead.
-0 52 45.01	- 13 11 15.1	- 8.67		Royal Observatory of the University.
-0 57 52.41	- 14 28 6.1	- 9.51		Manora Observatory, Austria.
-0 19 8.55	- 4 47 8.3	- 3.14		Obs. of the Univ., St. Genis, Laval.
+5 57 37.93	+ 89 24 29.0	+58.75		Washburn Obs. of Univ. of Wisconsin.
-5 20 59.12	- 80 14 46.8	-52.73		Founded by East India Company.
+0 14 45.12	+ 3 41 16.8	+ 2.42		Ast. and Meteorological Observatory.
-8 3 50	-120 57 30	-79.48		Meteorological Observatory.
+8 9 5.6	+122 16 24.0	+80.35		Chronometer and Time Station, Navy Yard.
+0 33 48.4	+ 8 27 6.0	+ 5.55		Obs. of Col. Cooper, near Collooney.
-0 21 34.59	- 5 23 38.9	- 3.54		National Obs., Univ. of Aix-Marseilles.
-3 50 12.6	- 57 33 9.0	-37.82		Royal Alfred Observatory, Port-Louis.
-9 39 54.0	-144 58 30.0	-95.26		State Obs.; transf. from Williamstown in 1861.
-0 8 55.6	- 2 13 54.0	- 1.47		Seine-et-Oise, near Paris.
+4 50 37.18	+ 72 39 17.7	+47.74		Wesleyan University Observatory.
-0 36 45.92	- 9 11 28.8	- 6.04		Royal Observatory, Brera.
+6 12 56.84	+ 93 14 12.6	+61.27		Obs. of the State University of Minnesota.
-9 24 30.75	-141 7 41.3	-92.74		International Latitude Observatory.
-0 43 42.9	- 10 55 43.5	- 7.18		Ducal Observatory.
+4 54 18.63	+ 73 34 39.4	+48.35		McGill University Observatory.
-2 30 17.09	- 37 34 16.3	-24.69		Obs. of the Imperial University, Presnia.
+8 6 34.89	+121 38 43.3	+79.93		Lick Obs. of the University of California.
+7 52 14.33	+118 3 34.9	+77.58		Solar Observatory, near Pasadena, Cal.

No.	PLACE.	Geographic Latitude.			Reduction to Geocentric Latitude.		Alti- tude (Meters).	Log $\rho$ (Including altitude).	Longitude from Washington.		
		°	'	"	'	"			h	m	s
137	Munich, Bavaria .	+48	8	45.5	-11	31.7	528	9.999 227	-	5	54 41.85
138	Naples, Italy . .	+40	51	46.3	-11	28.1	154	9.999 387	-	6	5 17.51
139	Nashville, Tenn. .	+36	8	54.4	-11	2.0	. . .	9.999 494	+	0	38 56.4
140	Natal, S. Africa .	-29	50	46.6	+ 9	59.6	79	9.999 645	-	7	12 16.96
141	Neuchâtel . . .	+46	59	50.6	-11	34.1	488	9.999 254	-	5	36 5.71
142	New Brunswick, N. J.	+40	30	1.3	-11	26.7	21	9.999 387	-	0	10 28.4
143	New Haven, Conn.	+41	19	22.3	-11	29.6	40	9.999 368	-	0	16 35.20
144	New York, N. Y. .	+40	48	34.6	-11	27.9	. . .	9.999 378	-	0	12 26
145	Nice, France . .	+43	43	16.9	-11	34.9	376	9.999 330	-	5	37 27.96
146	Nikolaieff, Russia .	+46	58	21.8	-11	34.2	55	9.999 225	-	7	16 9.58
147	Northampton, Mass.	+42	19	2	-11	32.4	81	9.999 345	-	0	17 42.7
148	Northfield, Minn. .	+44	27	41.6	-11	35.5	320	9.999 307	+	1	4 20.03
149	Oakland, Cal. . .	+37	48	5	-11	13.2	11	9.999 454	+	3	0 50.77
150	Odessa, Russia . .	+46	28	37.9	-11	34.9	. . .	9.999 234	-	7	11 18.0
151	Odessa, Russia . .	+46	28	36.7	-11	34.9	55	9.999 237	-	7	11 17.88
152	O-Gyalla, Hungary	+47	52	27.3	-11	32.4	113	9.999 206	-	6	21 1.32
153	Omaha, Nebr. . .	+41	16	5.6	-11	29.5	344	9.999 390	+	1	15 31.18
154	Oncativo, Arg. Rep.	-31	55	10	+10	23.5	280	9.999 613	-	0	53 31.0
155	Orono, Maine . .	+44	53	58	-11	35.6	41	9.999 277	-	0	33 35.5
156	Ottawa, Canada .	+45	23	37.6	-11	35.6	85	9.999 267	-	0	5 23.78
157	Oxford, Miss. . .	+34	22	12.6	-10	47.5	. . .	9.999 536	+	0	49 51.3
158	Oxford, Eng. . .	+51	45	35.4	-11	16.9	65	9.999 104	-	5	3 13.2
159	Oxford, Eng. . .	+51	45	34.2	-11	16.9	64	9.999 104	-	5	3 15.4
160	Padua, Italy . .	+45	24	5	-11	35.6	30	9.999 263	-	5	55 44.97
161	Palermo, Sicily .	+38	6	44.0	-11	15.1	72	9.999 450	-	6	1 41.68
162	Paris, France . .	+48	50	11.2	-11	29.8	61	9.999 178	-	5	17 36.75
163	Perth . . . . .	-31	57	8.9	+10	23.8	61	9.999 597	+	11	8 22.48
164	Philadelphia, Pa. .	+39	58	2.1	-11	24.6	74	9.999 404	-	0	7 9.2
165	Pola, Austria . .	+44	51	48.7	-11	35.6	30	9.999 277	-	6	3 38.67
166	Potsdam, Prussia .	+52	22	56.0	-11	13.3	97	9.999 091	-	6	0 31.7
167	Poughkeepsie, N. Y.	+41	41	18	-11	30.8	46	9.999 359	-	0	12 42.13
168	Prague, Bohemia .	+50	5	15.8	-11	25.1	197	9.999 155	-	6	5 56.1
169	Princeton, N. J. .	+40	20	55.8	-11	26.1	50	9.999 393	-	0	9 36.34
170	Providence, R. I. .	+41	50	21	-11	31.2	64	9.999 356	-	0	22 39.83
171	Providence, R. I. .	+41	49	46.4	-11	31.2	. . .	9.999 352	-	0	22 38.14
172	Pulkowa, Russia .	+59	46	18.7	-10	6.2	74	9.998 914	-	7	9 34.42
173	Quebec, Canada .	+46	47	59.2	-11	34.4	90	9.999 231	-	0	23 23.14
174	Quito . . . . .	- 0	14	0	+ 0	5.6	2908	0.000 198	+	0	5 50.88
175	Riga, Russia . .	+56	57	9.3	-10	36.9	. . .	9.998 974	-	6	44 43.95
176	Rio de Janeiro . .	-22	54	23.6	+ 8	17.7	61	9.999 784	-	2	15 34.4
177	Rome, Italy . . .	+41	53	53.6	-11	31.3	51	9.999 354	-	5	58 11.33
178	Rome, Italy . . .	+41	53	33.5	-11	31.3	65	9.999 355	-	5	58 12.15
179	Rome, Italy . . .	+41	54	4.8	-11	31.4	100	9.999 357	-	5	58 5.25
180	San Fernando . .	+36	27	42.0	-11	4.3	30	9.999 488	-	4	43 26.6
181	San Francisco, Cal.	+37	47	27.9	-11	13.2	. . .	9.999 454	+	3	1 27.08

LONGITUDE FROM GREENWICH.		Reduction from Gr Sid. Time of Mean Noon to Local S. T. M. N.	DESCRIPTION.
in Time.	In Arc.		
m s	° ' "	s	
16 26.07	- 11 36 31.0	- 7.63	Royal Observatory.
17 1.73	- 14 15 26.0	- 9.37	Royal Obs., Capo di Monte.
17 12.2	+ 86 48 3.0	+57.04	Observatory of Vanderbilt University.
4 1.18	- 31 0 17.7	-20.37	, Durban.
7 49.93	- 6 57 29.0	- 4.57	Cantonal Switzerland.
17 47.4	+ 74 26 51	+48.92	Schanck College.
11 40.58	+ 72 55 8.7	+47.92	Old Obs. 45° .8 S., 1° .58 W.
15 50	+ 73 57 30	+48.60	Columbia Univ. Obs. Old Obs. 3° 11' .5 S., 3° .6 E.
19 12.18	- 7 18 2.7	- 4.80	Mt. Gros, near Nice.
7 53.80	- 31 58 27.0	-21.01	Naval
10 33 1	+ 72 38 16.5	+47.73	Smith
2 35.81	+ 93 8 57.1	+61.21	of Carleton College.
9 6.55	+122 16 38.3	+80.35	Chabot
3 2.18	- 30 45 32.7	-20.21	Branch
3 2.10	- 30 45 31.5	-20.21	
2 45.54	- 18 11 23.1	-11.95	
13 46.96	+ 95 56 44.4	+63.05	
4 44.8	+ 63 41 12.0	+41.85	
14 40.3	+ 68 40 4.5	+45.12	of Maine.
2 52.00	+ 75 43 0.0	+49.75	
18 7.1	+ 89 31 46.5	+58.83	Observatory of the University of Mississippi.
5 2.6	+ 1 15 39.0	+ 0.83	
5 0.4	+ 1 15 6.0	+ 0.82	
17 29.19	- 11 52 17.9	- 7.80	Royal
13 25.90	- 13 21 28.5	- 8.78	Royal Observatory.
9 20.97	- 2 20 14.6	- 1.53	National
13 21.74	-115 50 26.1	-76.12	Australia.
1 6.6	+ 75 16 39.0	+49.46	Flower University of Pennsylvania.
15 22.89	- 13 50 43.3	- 9.10	Obs. of Hydrographic Office.
12 15.9	- 13 3 58.5	- 8.59	Observatory.
15 33.65	+ 73 53 24.7	+48.55	Vassar
17 40.3	- 14 25 4.5	- 9.47	Royal the University.
18 39.44	+ 74 39 51.6	+49.06	of Princeton University.
15 35.95	+ 71 23 59.3	+46.92	Brown University.
15 37.64	+ 71 24 24.6	+46.92	Mr. Seagrave's
1 18.64	- 30 19 39.6	-19.93	Obs. Central Nicolas, near St. Petersburg.
4 52.64	+ 71 13 9.6	+46.80	Bonner's Hill.
4 6.66	+ 78 31 39.9	+51.60	National Observatory of Ecuador.
16 28.17	- 24 7 2.6	-15.85	
12 41.4	+ 43 10 21.0	+28.37	of Brazil.
9 55.55	- 12 28 53.3	- 8.20	Royal Roman College.
9 56.37	- 12 29 5.6	- 8.20	Royal at Capitol.
9 49.47	- 12 27 22.0	- 8.18	V
4 49.2	+ 6 12 18.0	+ 4.08	Naval Cadiz, Spain.
9 42.86	+122 25 42.9	+80.45	Davidson

NO.	PLACE.	Geographic Latitude.	Reduction to Geocentric Latitude.	Altitude (Meters).	Log $\rho$ (including altitude).	Longitude from Washington.
		" "	" "			h m s
182	San Luis, Arg. Rep.	-33 17 45.7	+10 37.6	800	9.999 616	- 0 42 54
183	" "	-33 26 42.0	+10 39.0	519	9.999 594	- 0 25 29.56
184	Mass.	+42 15 18.2	-11 32.2	76	9.999 346	- 0 17 55.49
185	St. Louis, Mo. . .	+38 38 3.0	-11 18.1	. . .	9.999 432	+ 0 52 33.48
186	St. Petersburg . .	+59 56 32.0	-10 4.2	4	9.998 906	- 7 9 27.2
187	Sweden	+59 20 33.0	-10 11.3	44	9.998 922	- 6 20 29.77
188	Eng. .	+53 50 40	-11 3.4	116	9.999 056	- 4 58 23.10
189	Alsace	+48 35 0.3	-11 30.5	144	9.999 190	- 5 39 20.47
190	, Pa. .	+39 54 23.3	-11 24.3	. . .	9.999 401	- 0 6 50.89
191	, S. W. .	-33 51 41.1	+10 42.9	44	9.999 552	+ 8 46 54.68
192	Syracuse, N. Y. .	+43 2 13.1	-11 33.9	160	9.999 332	- 0 3 42.42
193	Tacubaya . . .	+19 24 17.5	- 7 14.8	2280	9.999 995	+ 1 28 30.75
194	Tashkent . . .	+41 19 31.3	-11 29.6	457	9.999 396	- 9 45 26.58
195	Taunton, Mass. .	+41 54 0	-11 31.3	8	9.999 351	- 0 23 56
196	. .	+42 39 27	-11 33.1	398	9.999 358	- 6 3 12
197	. .	+35 39 17.5	-10 58.3	. . .	9.999 507	+ 9 32 46.20
198	. .	+43 39 35.9	-11 34.8	108	9.999 313	+ 0 9 18.87
199	. .	+43 36 45	-11 34.7	194	9.999 320	- 5 14 5.66
200	. .	+45 38 45.4	-11 35.5	67	9.999 260	- 6 3 18.73
201	Troy, N. Y. : . .	+42 43 52.9	-11 33.4	. . .	9.999 329	- 0 13 33.49
202	Tschardjui . . .	+39 8 10.7	-11 20.7	167	9.999 431	- 9 22 13.1
203	Tulse Hill . . .	+51 26 47.0	-11 18.6	48	9.999 111	- 5 7 48.1
204	. . .	+45 4 8.0	-11 35.7	276	9.999 288	- 5 39 2.96
205	Ala. .	+33 12 36.8	-10 36.7	. . .	9.999 564	+ 0 41 55.96
206	Ukiah, Cal. . . .	+39 8 12.1	-11 20.7	220	9.999 435	+ 3 4 34.5
207	Upsala, Sweden .	+59 51 29.4	-10 5.2	21	9.998 909	- 6 18 45.93
208	Urbana, Ill. . . .	+40 6 20.2	-11 25.2	236	9.999 412	+ 0 44 38.2
209	Utrecht, Netherlands	+52 5 9.6	-11 15.0	13	9.999 093	- 5 28 46.8
210	Venice, Italy . . .	+45 26 10.5	-11 35.6	15	9.999 261	- 5 57 37.90
211	Vienna, Austria .	+48 13 55.4	-11 31.5	240	9.999 205	- 6 13 37.17
212	Vienna, Austria .	+48 12 53.8	-11 31.6	214	9.999 204	- 6 13 41.1
213	Vienna, Austria .	+48 12 46.7	-11 31.6	280	9.999 208	- 6 13 26.89
214	. . .	+52 13 4.7	-11 14.3	110	9.999 096	- 6 32 23.06
215	, D. C.	+38 55 14.0	-11 19.6	82	9.999 431	0 0 0.00
216	, D. C.	+38 53 38.8	-11 19.4	31	9.999 428	- 0 0 3.63
217	D. C	+38 53 17.3	-11 19.4	9	9.999 427	- 0 0 9.6
218	D. C	+38 56 14.8	-11 19.7	. . .	9.999 425	- 0 0 15.78
219	ass. .	+42 17 34.8	-11 32.3	61	9.999 344	- 0 23 3
220	N. Z. .	-41 17 3.8	+11 29.5	127	9.999 375	+ 7 12 39.95
221	N. Y.	+41 23 22.1	-11 29.9	170	9.999 375	- 0 12 25.23
222	. .	+53 31 52.2	-11 5.7	8	9.999 057	- 5 40 50.89
223	Wis.	+42 34 12.6	-11 33.0	335	9.999 356	+ 0 45 57.46
224	Mass.	+42 42 30	-11 33.2	213	9.999 344	- 0 15 26
225	蘇 S W.	-33 36 30.8	+10 40.6	16	9.999 556	+ 8 48 23.7
226	Zò-Sè, China . .	+31 5 47.7	-10 14.4	100	9.999 619	+10 46 59.5
227	Zürich . . . .	+47 22 38.3	-11 33.5	468	9.999 243	- 5 42 28.08

LONGITUDE FROM GREENWICH.		Reduction from Gr. Sid. Time of Mean Noon to Local S. T. M. N.	DESCRIPTION.
In Time.	In Arc.		
h m s	° ' "	s	
+ 4 25 22	+ 66 20 30	+ 43.60	Southern Observatory of Carnegie Institution.
+ 4 42 46.22	+ 70 41 33.3	+ 46.45	National Obs. of Chile. Old Obs. 16''.6N., 9°.5 E.
+ 4 50 20.29	+ 72 35 4.3	+ 47.70	Observatory of Mt. Holyoke College.
+ 6 0 49.26	+ 90 12 18.9	+ 59.27	Washington University Observatory.
− 2 1 11.4	− 30 17 51.0	− 19.91	Imperial University Observatory, Russia.
− 1 12 13.99	− 18 3 29.9	− 11.87	Observatory of Academy of Science.
+ 0 9 52.68	+ 2 28 10.2	+ 1.62	Stonyhurst College Observatory, near Blackburn.
− 0 31 4.69	− 7 46 10.3	− 5.11	Imperial University Observatory.
+ 5 1 24.89	+ 75 21 13.4	+ 49.52	Sproul Observatory of Swarthmore College.
− 10 4 49.54	− 151 12 23.1	− 99.36	Government Observatory.
+ 5 4 33.36	+ 76 8 20.4	+ 50.03	Observatory of Syracuse University.
+ 6 36 46.53	+ 99 11 38.0	+ 65.18	National Observatory of Mexico.
− 4 37 10.80	− 69 17 42.0	− 45.53	Turkestan, Russia.
+ 4 44 20	+ 71 5 0	+ 46.71	Mr. Metcalf's Observatory.
− 0 54 56	− 13 44 0	− 9.02	At Collurania, near Teramo.
− 9 18 58.02	− 139 44 30.3	− 91.82	University Observatory.
+ 5 17 34.65	+ 79 23 39.7	+ 52.17	University Observatory.
− 0 5 49.88	− 1 27 28.2	− 0.96	University Observatory.
− 0 55 2.95	− 13 45 44.3	− 9.04	Imperial Maritime Observatory.
+ 4 54 42.29	+ 73 40 34.3	+ 48.41	Observatory Rensselaer Polytechnic Institute.
− 4 13 57.3	− 63 29 19.5	− 41.72	International Latitude Obs., Turkestan.
+ 0 0 27.7	+ 0 6 55.5	+ 0.08	Observatory of Sir W. Huggins, London.
− 0 30 47.18	− 7 41 47.7	− 5.06	Royal Observatory, Palazzo Madama.
+ 5 50 11.74	+ 87 32 56.1	+ 57.53	Observatory of the University of Alabama.
+ 8 12 50.3	+ 123 12 35	+ 80.96	International Latitude Observatory.
− 1 10 30.15	− 17 37 32.3	− 11.58	University Observatory.
+ 5 52 54.0	+ 88 13 30	+ 57.97	Observatory of the University of Illinois.
− 0 20 31.0	− 5 7 45.0	− 3.37	University Observatory, Sonnenborgh.
− 0 49 22.12	− 12 20 31.8	− 8.11	Observatory of the Nautical Institute.
− 1 5 21.39	− 16 20 20.9	− 10.74	Imperial Univ. Obs. Old Obs. 1' 20'' S., 10°.25 E.
− 1 5 25.3	− 16 21 19.5	− 10.75	Oppolzer Observatory, Josephstadt.
− 1 5 11.11	− 16 17 46.7	− 10.71	Kuffner Observatory, Ottakring.
− 1 24 7.28	− 21 1 49.2	− 13.82	Imperial University Observatory.
+ 5 8 15.78	+ 77 3 56.7	+ 50.64	U. S. Naval Observatory, Georgetown Heights.
+ 5 8 12.15	+ 77 3 2.3	+ 50.63	Old U. S. Naval Observatory. 1842-1893.
+ 5 8 6.2	+ 77 1 33.0	+ 50.61	Smithsonian Astrophysical Observatory.
+ 5 8 0.0	+ 77 0 0.0	+ 50.60	Catholic University Obs., Brookland, D. C.
+ 4 45 13	+ 71 18 15	+ 46.85	Whitin Observatory of Wellesley College.
− 11 39 4.27	− 174 46 4.0	− 114.84	Hector Observatory. Old Obs. 16''.7 N., 1°.04 E.
+ 4 55 50.55	+ 73 57 38.3	+ 48.60	U. S. Military Academy. Old Obs. 9'' N., 1°.2 E.
− 0 32 35.11	− 8 8 46.7	− 5.35	Imperial Naval Observatory of Germany.
+ 5 54 13.24	+ 88 33 18.6	+ 58.19	Yerkes Observatory of University of Chicago.
+ 4 52 50	+ 73 12 30	+ 48.10	Field Memorial Observatory, Williams College.
− 10 3 20.5	− 150 50 7.5	− 99.11	Mr. John Tebbutt's Observatory.
− 8 4 44.7	− 121 11 10.5	− 79.63	Obs. of the Jesuits near Shanghai.
− 0 34 12.30	− 8 33 4.5	− 5.62	Obs. of the Polytechnic School, Switzerland.



## THE COMPUTATION OF LUNAR DISTANCES.

The tables of lunar distances formerly given on pages XIII to XVIII, inclusive, for each month of the Greenwich Ephemeris, are omitted, as it has been decided by the authorities of the Navy Department that they are now of little practical use to navigators. However, in case it is desired to use this method, the angular distance between the Moon and any heavenly body may be calculated by solving the spherical triangle of which the known parts are the polar distances of the Moon and the other body and the difference of their right ascensions, or, in other words, the angle at the pole between their hour-circles. Then, the Greenwich mean time of the observation being approximately known, and the lunar distances for the star or other body calculated for the even hour before and after, the required lunar distance may be interpolated and the longitude derived by the methods given in books on navigation.

## EXAMPLE 1.

Find the lunar distance of  $\alpha$  Arietis, January 15, 1915, at 6 P. M. Greenwich Mean Time.

Let  $\alpha$  and  $\delta$  = Right Ascension and Declination of the star

"  $\alpha'$  and  $\delta'$  = " " " " " " Moon

" D = Lunar Distance

Also let  $\tan M = \tan \delta' \sec (\alpha - \alpha')$

Then  $\cos D = \sin \delta' \cos (M - \delta) \operatorname{cosec} M$

$\alpha = 2^h 2^m 23^s.5$	$M = 266^\circ 3' 30''$
$\alpha' = 19^h 55^m 31^s.7$	$\delta = + 23^\circ 3' 52''$
$\alpha - \alpha' = 6^h 6^m 51^s.8$	$M - \delta = 242^\circ 59' 38''$
$\alpha - \alpha' = 91^\circ 42' 57''$	$\sin \delta' = 9.600477 \text{ n}$
$\delta' = -23^\circ 29' 14''$	$\cos (M - \delta) = 9.657137 \text{ n}$
$\tan \delta' = 9.638037 \text{ n}$	$\operatorname{cosec} M = 0.001029 \text{ n}$
$\sec (\alpha - \alpha') = 1.523712 \text{ n}$	$\cos D = 9.258643 \text{ n}$
$\tan M = 1.161749$	$D = 100^\circ 27' 5''$

## EXAMPLE 2.

Find the lunar distance of Venus, June 8, 1915, at midnight, Greenwich Mean Time. In this case the distance is smaller and the following method is more accurate:

Let  $\alpha$  and  $\delta$  = Right Ascension and Declination of the planet

"  $\alpha'$  and  $\delta'$  = " " " " " " Moon

" D = Lunar Distance

Also let  $\tan N = \tan \frac{1}{2} (\alpha - \alpha') \cos \frac{1}{2} (\delta + \delta') \operatorname{cosec} \frac{1}{2} (\delta - \delta')$

Then  $\sin \frac{1}{2} D = \sin \frac{1}{2} (\alpha - \alpha') \cos \frac{1}{2} (\delta + \delta') \operatorname{cosec} N$

$\sin N$  and  $\sin \frac{1}{2} (\alpha - \alpha')$  have the same algebraic sign.

$\alpha = 3^h 17^m 57^s.8$	$\tan \frac{1}{2} (\alpha - \alpha') = 9.194835$
$\alpha' = 2^h 6^m 45^s.3$	$\cos \frac{1}{2} (\delta + \delta') = 9.979650$
$\alpha - \alpha' = 1^h 11^m 12^s.5$	$\operatorname{cosec} \frac{1}{2} (\delta - \delta') = 1.945219 \text{ n}$
$\alpha - \alpha' = 17^\circ 48' 8''$	$\tan N = 1.119704 \text{ n}$
$\delta = +16^\circ 45' 12''$	$N = 94^\circ 20' 27''$
$\delta' = +18^\circ 3' 13''$	
$\delta + \delta' = 34^\circ 48' 25''$	$\sin \frac{1}{2} (\alpha - \alpha') = 9.189573$
$\delta - \delta' = -1^\circ 18' 1''$	$\cos \frac{1}{2} (\delta + \delta') = 9.979650$
	$\operatorname{cosec} N = 0.001247$
$\frac{1}{2} (\alpha - \alpha') = 8^\circ 54' 4''$	$\sin \frac{1}{2} D = 9.170470$
$\frac{1}{2} (\delta + \delta') = 17^\circ 24' 12''$	$\frac{1}{2} D = 8^\circ 30' 55''$
$\frac{1}{2} (\delta - \delta') = -0^\circ 39' 0''$	$D = 17^\circ 1' 50''$

[Eph 15]

FOR FINDING THE LATITUDE BY AN OBSERVED ALTITUDE OF POLARIS, 1915.

Reduce the observed altitude of Polaris to the true altitude.  
Reduce the recorded time of observation to the local sidereal time.  
Take out the App. R. A. and App. Decl. of Polaris for the time of observation (pp. 251-262).  
Subtract the App. R. A. from the local sidereal time of observation and the remainder is the hour-angle of Polaris.  
With this hour-angle as the vertical argument, and the App. Decl. of Polaris as the horizontal argument, take out the correction from Table I and add it to or subtract it from the true altitude, according to its sign.  
For other altitudes than 45°, corrections taken from the supplementary table at the bottom of Table I (Table Ia) may be applied when necessary for the degree of accuracy required.  
*Example.*—1915, August 5, at 10<sup>h</sup> 40<sup>m</sup> 30<sup>s</sup> P. M. local mean solar time, in longitude 59° west of Greenwich, suppose the true altitude of Polaris to be 33° 20' 0'', required the latitude of the place.

Local astronomical mean time . . . . .	h m s	10 40 30
Reduction from Table III for 10 <sup>h</sup> 40 <sup>m</sup> 30 <sup>s</sup> . . . . .	+ I	45
Greenwich sidereal time of mean noon, August 5, page 87 . . . . .	8 51 49	
Reduction from Table III, for longitude (=3 <sup>h</sup> 56 <sup>m</sup> west, or plus) . . . . .	+ 0	39
<hr/>		
Sum (having regard to signs) is equal to local sidereal time . . . . .	h m s	19 34 43
R. A. of Polaris (page 258) for time of observation . . . . .	I 29 39	
<hr/>		
Remainder is equal to hour-angle of Polaris . . . . .	h m s	18 5 4
Decl. of Polaris (page 258) for time of observation 88° 51' 6'' . . . . .	. , "	
True altitude . . . . .	+33 20 0	
Correction from Table I . . . . .	- 0 0 50	
Correction from Table Ia . . . . .	- 14	
<hr/>		
Latitude of the place . . . . .	+33 18 56	

Observations of Polaris for latitude should be made when practicable near the times of upper or of lower culminations (hour-angle 0<sup>h</sup> or 12<sup>h</sup>). However, at sea, if made near elongation (hour-angle 6<sup>h</sup> or 18<sup>h</sup>), the hour-angle, and hence the local time, should be known within one minute.

Decl. H. A.	88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	Decl. H. A.
h m	' "	' "	' "	' "	' "	' "	h m
0 0	-69 0 I	-68 50 I	-68 40 0	-68 30 0	-68 20 0	-68 10 0	24 0
3	68 59 I	68 49 I	68 40 I	68 30 I	68 20 I	68 10 I	23 57
6	68 58 2	68 48 2	68 39 2	68 29 2	68 19 2	68 9 2	54
9	68 56 2	68 46 2	68 37 2	68 27 2	68 17 2	68 7 2	51
12	68 54 3	68 44 3	68 34 3	68 24 3	68 14 3	68 4 3	48
15	-68 51 3	-68 41 3	-68 31 3	-68 21 3	-68 11 3	-68 1 3	23 45
18	68 47 4	68 37 4	68 27 4	68 17 4	68 7 4	67 57 4	42
21	68 42 5	68 32 5	68 22 5	68 12 5	68 2 5	67 52 5	39
24	68 36 6	68 27 6	68 17 6	68 7 6	67 57 6	67 47 6	36
27	68 30 7	68 21 7	68 11 7	68 1 7	67 51 7	67 41 7	33
30	-68 23 7	-68 14 8	-68 4 8	-67 54 7	-67 44 7	-67 34 7	23 30
33	68 16 8	68 6 8	67 56 8	67 47 8	67 37 8	67 27 8	27
36	68 8 9	67 58 9	67 48 9	67 39 9	67 29 9	67 19 9	24
39	67 59 10	67 49 10	67 39 10	67 30 10	67 20 10	67 10 10	21
42	67 49 11	67 39 10	67 30 11	67 20 10	67 10 10	67 0 10	18
45	-67 38 11	-67 29 11	-67 19 11	-67 10 11	-67 0 11	-66 50 11	23 15
48	67 27 12	67 18 12	67 8 12	66 59 12	66 49 12	66 39 12	12
51	67 15 13	67 6 13	66 56 13	66 47 13	66 37 13	66 27 13	9
54	67 2 13	66 53 13	66 44 13	66 34 13	66 24 13	66 15 13	6
57	66 49 14	66 40 14	66 31 14	66 21 14	66 11 13	66 2 14	3
I 0	-66 35 14	-66 26 14	-66 17 15	-66 7 14	-65 58 15	-65 48 14	23 0
3	66 21 15	66 12 15	66 2 15	65 53 15	65 43 15	65 34 16	22 57
6	66 6 16	65 57 16	65 47 16	65 38 16	65 28 16	65 18 16	54
9	65 50 17	65 41 17	65 31 17	65 22 17	65 12 16	65 2 16	51
I 12	-65 33 17	-65 24 17	-65 14 17	-65 5 17	-64 56 16	-64 46 16	22 48



FOR FINDING THE LATITUDE BY AN OBSERVED ALTITUDE OF POLARIS, 1915.

Decl. H. A.	88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	Decl. H. A.
h m	' "	' "	' "	' "	' "	' "	h m
1 12	-65 33 18	-65 24 18	-65 14 17	-65 5 17	-64 56 18	-64 46 17	22 48
1 15	65 15 18	65 6 18	64 57 18	64 48 18	64 38 18	64 29 18	45
1 18	64 57 18	64 48 18	64 39 19	64 30 19	64 20 18	64 11 19	42
2 1	64 39 20	64 30 20	64 20 19	64 11 19	64 2 20	63 52 19	39
2 4	64 19 20	64 10 20	64 1 20	63 52 20	63 42 20	63 33 20	36
1 27	-63 59 20	-63 50 20	-63 41 21	-63 32 21	-63 22 20	-63 13 20	22 33
1 30	63 39 22	63 30 22	63 20 21	63 11 21	63 2 21	62 53 21	30
1 33	63 17 22	63 8 22	62 59 22	62 50 22	62 41 22	62 32 22	27
1 36	62 55 23	62 46 23	62 37 23	62 28 23	62 19 23	62 10 23	24
1 39	62 32 23	62 23 23	62 14 23	62 5 23	61 56 23	61 47 23	21
1 42	-62 9 24	-62 0 24	-61 51 24	-61 42 24	-61 33 24	-61 24 24	22 18
1 45	61 45 25	61 36 24	61 27 25	61 18 24	61 9 24	61 0 25	15
1 48	61 20 25	61 12 24	61 2 25	60 54 24	60 45 24	60 35 25	12
1 51	60 55 25	60 46 26	60 37 25	60 29 25	60 20 25	60 10 25	9
1 54	60 29 27	60 20 26	60 11 26	60 3 27	59 54 26	59 45 26	6
1 57	-60 2 27	-59 54 27	-59 45 27	-59 36 27	-59 28 27	-59 19 27	22 3
2 0	59 35 28	59 27 28	59 18 28	59 9 28	59 1 28	58 52 28	22 0
2 3	59 7 29	58 59 29	58 50 28	58 41 28	58 33 28	58 24 28	21 57
2 6	58 38 29	58 30 29	58 22 29	58 13 29	58 5 29	57 56 28	54
2 9	58 9 29	58 1 29	57 53 30	57 44 29	57 36 29	57 28 30	51
2 12	-57 40 31	-57 32 31	-57 23 30	-57 15 30	-57 7 30	-56 58 30	21 46
2 15	57 9 31	57 1 31	56 53 31	56 45 31	56 37 31	56 28 30	45
2 18	56 38 31	56 30 31	56 22 31	56 14 31	56 6 31	55 58 31	42
2 21	56 7 32	55 59 32	55 51 32	55 43 32	55 35 32	55 27 32	39
2 24	55 35 33	55 27 33	55 19 33	55 11 32	55 3 32	54 55 32	36
2 27	-55 2 33	-54 54 33	-54 46 33	-54 39 33	-54 31 33	-54 23 33	21 33
2 30	54 29 33	54 21 33	54 13 33	54 6 33	53 58 33	53 50 33	30
2 33	53 55 34	53 48 33	53 40 33	53 32 34	53 24 34	53 16 34	27
2 36	53 20 34	53 13 35	53 6 34	52 58 34	52 50 34	52 42 34	24
2 39	52 46 36	52 39 36	52 31 35	52 23 35	52 16 34	52 8 34	21
2 42	-52 10 36	-52 3 36	-51 56 36	-51 48 36	-51 41 36	-51 33 35	21 18
2 45	51 34 36	51 27 36	51 20 37	51 12 36	51 5 36	50 58 36	15
2 48	50 58 37	50 51 36	50 43 37	50 36 36	50 29 36	50 22 36	12
2 51	50 21 38	50 14 37	50 6 37	49 59 37	49 52 37	49 45 37	9
2 54	49 43 38	49 36 38	49 29 38	49 22 38	49 15 38	49 8 38	6
2 57	-49 5 38	-48 58 38	-48 51 38	-48 44 38	-48 37 38	-48 30 38	21 3
3 0	48 27 39	48 20 39	48 13 39	48 6 39	47 59 39	47 52 39	21 0
3 3	47 48 40	47 41 40	47 34 39	47 27 39	47 20 39	47 13 39	20 57
3 6	47 8 40	47 1 40	46 55 39	46 48 39	46 41 39	46 34 39	54
3 9	46 28 41	46 22 41	46 15 41	46 8 40	46 1 40	45 55 39	51
3 12	-45 47 41	-45 41 41	-45 34 41	-45 28 41	-45 21 41	-45 15 41	20 46
3 15	45 6 42	45 0 42	44 53 41	44 47 41	44 40 41	44 34 41	45
3 18	44 24 42	44 18 42	44 12 42	44 6 42	43 59 41	43 53 41	42
3 21	43 42 42	43 37 42	43 30 42	43 24 42	43 18 42	43 12 42	39
3 24	43 0 43	42 54 42	42 48 42	42 42 42	42 36 42	42 30 42	36
3 27	-42 17 43	-42 12 44	-42 5 43	-41 59 43	-41 53 43	-41 47 43	20 33
3 30	41 34 43	41 28 44	41 22 43	41 16 43	41 10 43	41 4 43	30
3 33	40 50 44	40 45 43	40 39 43	40 33 43	40 27 43	40 21 43	27
3 36	40 6 44	40 1 44	39 55 44	39 49 44	39 44 44	39 38 44	24
3 39	39 21 45	39 16 45	39 11 45	39 5 45	39 00 44	38 54 44	21
3 42	-38 36 45	-38 31 45	-38 26 45	-38 20 45	-38 15 45	-38 9 45	20 18
3 45	37 51 46	37 46 46	37 41 46	37 35 45	37 30 45	37 24 45	15
3 48	37 5 46	37 0 46	36 55 46	36 50 45	36 45 45	36 39 45	12
3 51	36 19 46	36 14 46	36 9 46	36 4 46	35 59 46	35 54 45	9
3 54	35 33 47	35 28 47	35 23 47	35 18 47	35 13 46	35 8 46	6
3 57	-34 46 47	-34 41 47	-34 36 47	-34 31 47	-34 27 47	-34 22 47	20 3
4 0	33 59 48	33 54 47	33 49 47	33 44 47	33 40 47	33 35 47	20 0
4 3	33 11 48	33 7 48	33 2 48	32 57 47	32 53 48	32 48 48	19 57
4 6	32 23 48	32 19 48	32 14 48	32 10 47	32 5 48	32 0 48	54
4 9	-31 35 48	-31 31 48	-31 26 48	-31 22 48	-31 17 48	-31 13 47	19 51

FOR FINDING THE LATITUDE BY AN OBSERVED ALTITUDE OF POLARIS, 1915.

Decl. H. A.		88° 51' 0"	88° 51' 10"	88° 51' 20"	88° 51' 30"	88° 51' 40"	88° 51' 50"	Decl. H. A.	
h	m	' "	' "	' "	' "	' "	' "	h	m
4	9	-31 35 49	-31 31 49	-31 26 48	-31 22 48	-31 17 48	-31 13 48	19	51
	12	30 46 48	30 42 48	30 38 48	30 34 48	30 29 48	30 25 48		48
	15	29 58 48	29 54 48	29 49 49	29 45 49	29 41 48	29 36 49		45
	18	29 9 49	29 5 49	29 0 49	28 56 49	28 52 49	28 47 48		42
	21	28 19 50	28 15 49	28 11 49	28 7 49	28 3 49	27 59 49		39
4	24	-27 29 50	-27 26 50	-27 22 50	-27 18 50	-27 14 50	-27 10 50	19	36
	27	26 39 51	26 36 51	26 32 50	26 28 50	26 24 50	26 20 49		33
	30	25 48 51	25 45 51	25 42 51	25 38 50	25 34 50	25 31 49		30
	33	24 58 51	24 55 51	24 51 51	24 48 50	24 44 50	24 41 50		27
	36	24 7 51	24 4 51	24 1 51	23 57 50	23 54 51	23 51 51		24
4	39	-23 16 52	-23 13 51	-23 10 51	-23 7 51	-23 3 51	-23 0 51	19	21
	42	22 24 51	22 22 51	22 19 52	22 16 51	22 12 51	22 9 51		18
	45	21 33 52	21 31 52	21 27 51	21 25 52	21 21 51	21 18 51		15
	48	20 41 52	20 39 52	20 36 51	20 33 52	20 30 51	20 27 51		12
	51	19 49 52	19 47 52	19 44 52	19 42 52	19 39 52	19 36 52		9
4	54	-18 57 52	-18 55 52	-18 52 52	-18 50 52	-18 47 52	-18 44 51	19	6
4	57	18 5 53	18 3 53	18 0 52	17 58 52	17 55 52	17 53 52		3
5	0	17 12 53	17 10 52	17 8 52	17 6 52	17 3 52	17 1 52	19	0
	3	16 20 53	16 18 53	16 16 53	16 13 53	16 11 52	16 9 52	18	57
	6	15 27 53	15 25 53	15 23 53	15 21 53	15 19 52	15 17 53		54
5	9	-14 34 53	-14 32 53	-14 30 53	-14 28 52	-14 27 53	-14 24 52	18	51
	12	13 41 53	13 39 53	13 37 53	13 36 52	13 34 53	13 32 52		48
	15	12 48 53	12 46 53	12 44 53	12 43 53	12 41 53	12 39 53		45
	18	11 54 54	11 53 54	11 51 53	11 50 54	11 48 53	11 46 53		42
	21	11 0 53	10 59 53	10 58 54	10 56 53	10 55 53	10 53 53		39
5	24	-10 7 54	-10 6 54	-10 4 53	-10 3 53	-10 2 53	-10 0 53	18	36
	27	9 13 54	9 12 54	9 11 53	9 10 53	9 9 53	9 7 53		33
	30	8 19 54	8 18 54	8 17 54	8 16 54	8 16 53	8 14 53		30
	33	7 26 53	7 25 53	7 24 53	7 23 53	7 22 54	7 21 53		27
	36	6 32 54	6 31 54	6 30 54	6 29 54	6 28 54	6 28 54		24
5	39	-5 38 55	-5 37 54	-5 36 54	-5 35 53	-5 35 54	-5 34 53	18	21
	42	4 43 54	4 43 54	4 42 54	4 42 54	4 41 53	4 41 53		18
	45	3 49 54	3 49 54	3 48 54	3 48 54	3 48 53	3 48 53		15
	48	2 55 54	2 55 54	2 55 53	2 54 54	2 54 54	2 54 54		12
	51	2 1 55	2 1 54	2 1 54	2 1 53	2 0 54	2 0 54		9
5	54	-1 6 54	-1 7 54	-1 7 54	-1 7 54	-1 7 54	-1 6 53	18	6
5	57	0 12 54	0 13 54	0 13 54	0 13 54	0 13 54	0 13 53		3
6	0	+0 42 53	+0 41 54	+0 41 54	+0 41 54	+0 41 53	+0 41 53	18	0
	3	1 35 53	1 35 54	1 35 54	1 35 54	1 34 53	1 34 53	17	57
	6	2 29 55	2 29 54	2 29 54	2 28 53	2 28 54	2 28 54		54
6	9	+3 24 54	+3 23 54	+3 23 54	+3 22 54	+3 22 53	+3 21 54	17	51
	12	4 18 54	4 17 54	4 17 54	4 16 54	4 15 53	4 15 54		48
	15	5 12 54	5 11 54	5 10 53	5 9 53	5 9 54	5 8 53		45
	18	6 6 54	6 5 54	6 4 54	6 3 53	6 2 54	6 1 53		42
	21	7 0 54	6 59 54	6 58 53	6 56 53	6 56 53	6 54 53		39
6	24	+7 54 53	+7 53 53	+7 51 54	+7 50 53	+7 49 53	+7 48 53	17	36
	27	8 47 53	8 46 53	8 45 54	8 43 53	8 42 53	8 41 53		33
	30	9 41 54	9 40 54	9 38 53	9 37 54	9 35 53	9 34 53		30
	33	10 35 54	10 33 53	10 32 54	10 30 53	10 28 53	10 27 53		27
	36	11 28 54	11 26 54	11 25 53	11 23 53	11 21 53	11 19 53		24
6	39	+12 22 54	+12 20 53	+12 18 52	+12 16 52	+12 14 53	+12 12 53	17	21
	42	13 16 53	13 13 53	13 10 53	13 8 52	13 7 52	13 5 52		18
	45	14 9 52	14 6 52	14 3 53	14 1 53	13 59 52	13 57 52		15
	48	15 1 52	14 58 52	14 56 53	14 54 52	14 52 53	14 49 52		12
	51	15 54 52	15 51 53	15 48 52	15 46 52	15 44 52	15 41 52		9
6	54	+16 46 52	+16 44 52	+16 41 52	+16 38 52	+16 36 52	+16 33 52	17	6
6	57	17 38 52	17 36 52	17 33 52	17 30 52	17 28 52	17 25 51		3
7	0	18 30 52	18 28 52	18 25 51	18 22 52	18 19 51	18 16 51	17	0
	3	19 22 52	19 20 52	19 16 51	19 14 52	19 11 52	19 8 51		57
7	6	+20 14 52	+20 11 51	+20 8 52	+20 5 51	+20 2 51	+19 59 51		54

FOR FINDING THE LATITUDE BY AN OBSERVED ALTITUDE OF POLARIS, 1915.

Decl. H. A.		88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	Decl. H. A.	
h m		' "	' "	' "	' "	' "	' "	h m	
7	6	+20 14 52	+20 11 52	+20 8 51	+20 5 51	+20 2 51	+19 59 51	16	54
	9	21 6 51	21 3 51	20 59 51	20 56 51	20 53 51	20 50 51		51
	12	21 57 51	21 54 51	21 50 51	21 47 51	21 44 51	21 41 51		48
	15	22 48 51	22 45 51	22 41 51	22 38 51	22 35 51	22 31 50		45
	18	23 39 51	23 36 51	23 32 51	23 28 51	23 25 50	23 21 50		42
7	21	+24 30 50	+24 26 50	+24 22 50	+24 19 50	+24 15 50	+24 11 50	16	39
	24	25 20 50	25 16 50	25 12 50	25 9 49	25 5 50	25 1 50		36
	27	26 10 50	26 6 50	26 2 50	25 58 49	25 55 49	25 51 49		33
	30	27 0 49	26 56 49	26 52 49	26 48 49	26 44 49	26 40 49		30
	33	27 49 49	27 45 49	27 41 49	27 37 49	27 33 49	27 30 48		27
7	36	+28 38 49	+28 34 49	+28 30 49	+28 26 48	+28 22 48	+28 18 48	16	24
	39	29 27 49	29 23 49	29 19 48	29 14 49	29 10 48	29 6 48		21
	42	30 16 48	30 12 48	30 7 48	30 3 48	29 58 48	29 54 48		18
	45	31 4 48	31 0 48	30 55 48	30 51 47	30 46 48	30 42 47		15
	48	31 52 48	31 48 48	31 43 48	31 38 48	31 34 47	31 29 47		12
7	51	+32 40 47	+32 36 47	+32 31 47	+32 26 47	+32 21 47	+32 16 47	16	9
	54	33 27 47	33 23 47	33 18 47	33 13 46	33 8 47	33 3 47		6
7	57	34 14 47	34 10 46	34 5 46	33 59 47	33 55 46	33 50 46		3
8	0	35 1 46	34 56 46	34 51 46	34 46 46	34 41 46	34 36 45	16	0
	3	35 47 46	35 42 46	35 37 46	35 32 45	35 27 45	35 21 46	15	57
8	6	+36 33 46	+36 28 46	+36 23 45	+36 17 45	+36 12 45	+36 7 45	15	54
	9	37 19 45	37 14 45	37 8 45	37 2 45	36 57 45	36 52 44		51
	12	38 4 45	37 59 45	37 53 45	37 47 45	37 42 45	37 36 44		48
	15	38 49 44	38 43 44	38 37 44	38 32 45	38 26 44	38 20 44		45
	18	39 33 44	39 28 43	39 22 43	39 16 43	39 10 44	39 4 44		42
8	21	+40 17 43	+40 11 44	+40 5 44	+39 59 44	+39 54 43	+39 48 43	15	39
	24	41 0 43	40 55 43	40 49 43	40 43 43	40 37 43	40 31 42		36
	27	41 43 43	41 38 42	41 32 42	41 26 42	41 20 42	41 13 42		33
	30	42 26 42	42 20 42	42 14 42	42 8 42	42 2 42	41 55 42		30
	33	43 8 42	43 3 41	42 56 42	42 50 41	42 44 41	42 37 42		27
8	36	+43 50 42	+43 44 42	+43 38 41	+43 31 41	+43 25 41	+43 19 41	15	24
	39	44 32 42	44 26 42	44 19 41	44 12 41	44 6 41	44 0 40		21
	42	45 12 40	45 6 40	45 0 40	44 53 40	44 46 40	44 40 40		18
	45	45 53 40	45 47 40	45 40 40	45 33 40	45 26 40	45 20 39		15
	48	46 33 40	46 27 39	46 20 39	46 13 39	46 6 39	45 59 39		12
8	51	+47 13 39	+47 6 39	+46 59 39	+46 52 39	+46 45 39	+46 38 39	15	9
	54	47 52 38	47 45 38	47 38 38	47 31 38	47 24 38	47 17 38		6
8	57	48 30 38	48 23 38	48 16 38	48 9 38	48 2 38	47 55 38		3
9	0	49 8 38	49 1 38	48 54 37	48 47 37	48 40 37	48 33 37	15	0
	3	49 46 37	49 39 37	49 31 37	49 24 37	49 17 37	49 10 36	14	57
9	6	+50 23 36	+50 16 36	+50 8 36	+50 1 36	+49 54 36	+49 46 36	14	54
	9	50 59 36	50 52 36	50 44 36	50 37 36	50 30 35	50 22 36		51
	12	51 35 35	51 28 35	51 20 35	51 13 35	51 5 35	50 58 35		48
	15	52 10 35	52 3 35	51 55 35	51 48 35	51 40 35	51 33 35		45
	18	52 45 34	52 38 34	52 30 34	52 23 34	52 15 34	52 7 34		42
9	21	+53 19 34	+53 12 34	+53 4 34	+52 57 33	+52 49 34	+52 41 34	14	39
	24	53 53 33	53 46 33	53 38 33	53 30 33	53 23 33	53 15 33		36
	27	54 26 33	54 19 33	54 11 33	54 3 33	53 56 32	53 48 33		33
	30	54 59 33	54 52 32	54 44 32	54 36 32	54 28 32	54 20 32		30
	33	55 32 32	55 24 32	55 16 31	55 8 31	55 0 31	54 52 31		27
9	36	+56 4 31	+55 56 31	+55 47 31	+55 39 31	+55 31 31	+55 23 31	14	24
	39	56 35 30	56 27 30	56 18 31	56 10 30	56 2 30	55 54 30		21
	42	57 5 30	56 57 30	56 49 30	56 40 30	56 32 30	56 24 29		18
	45	57 35 29	57 27 29	57 19 29	57 10 29	57 2 29	56 53 29		15
	48	58 4 29	57 56 29	57 48 28	57 39 29	57 31 28	57 22 29		12
9	51	+58 33 28	+58 25 28	+58 16 28	+58 8 28	+57 59 28	+57 51 28	14	9
	54	59 1 27	58 53 27	58 44 28	58 36 27	58 27 27	58 19 27		6
9	57	59 28 27	59 20 27	59 12 27	59 3 27	58 54 27	58 46 26		3
10	0	59 55 26	59 47 26	59 39 26	59 30 26	59 21 26	59 12 26	14	0
10	3	+60 21 26	+60 13 26	+60 5 26	+59 56 26	+59 47 26	+59 38 26	13	51

FOR FINDING THE LATITUDE BY AN OBSERVED ALTITUDE OF POLARIS, 1915.

Decl. H. A.		88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	Decl. H. A.	
h	m	' ''	' ''	' ''	' ''	' ''	' ''	h	m
10	3	+60 21 26	+60 13 26	+60 5 25	+59 56 25	+59 47 26	+59 38 26	13	57
	6	60 47 25	60 39 25	60 30 25	60 21 25	60 13 24	60 4 24		54
	9	61 12 25	61 4 24	60 55 24	60 46 24	60 37 25	60 28 25		51
	12	61 37 24	61 28 24	61 19 24	61 10 24	61 2 23	60 53 23		48
	15	62 1 23	61 52 23	61 43 23	61 34 23	61 25 23	61 16 23		45
10	18	+62 24 23	+62 15 23	+62 6 23	+61 57 22	+61 48 23	+61 39 23	13	42
	21	62 47 22	62 38 22	62 29 22	62 19 22	62 11 21	62 2 21		39
	24	63 9 21	63 0 21	62 51 21	62 41 21	62 32 21	62 23 21		36
	27	63 30 21	63 21 21	63 12 21	63 2 21	62 53 21	62 44 21		33
	30	63 51 20	63 42 20	63 33 20	63 23 20	63 14 20	63 5 19		30
10	33	+64 11 19	+64 2 19	+63 53 19	+63 43 19	+63 34 19	+63 24 20	13	27
	36	64 30 19	64 21 19	64 12 18	64 2 19	63 53 19	63 44 18		24
	39	64 49 18	64 40 18	64 30 18	64 21 18	64 12 19	64 2 18		21
	42	65 7 18	64 58 17	64 48 17	64 39 17	64 29 18	64 20 17		18
	45	65 25 17	65 15 17	65 5 17	64 56 17	64 47 16	64 37 17		15
10	48	+65 42 16	+65 32 16	+65 22 16	+65 13 16	+65 3 16	+64 54 16	13	12
	51	65 58 15	65 48 15	65 38 15	65 29 15	65 19 15	65 10 15		9
	54	66 13 15	66 3 15	65 53 15	65 44 15	65 34 15	65 25 15		6
10	57	66 28 14	66 18 15	66 8 15	65 59 15	65 49 15	65 40 15		3
11	0	66 42 13	66 32 14	66 22 14	66 13 14	66 3 14	65 54 14	13	0
11	3	+66 55 13	+66 45 13	+66 35 13	+66 26 13	+66 16 13	+66 7 12	12	57
	6	67 8 12	66 58 12	66 48 12	66 39 12	66 29 12	66 19 12		54
	9	67 20 11	67 10 12	67 0 12	66 51 11	66 41 11	66 31 11		51
	12	67 31 11	67 22 12	67 12 12	67 2 11	66 52 11	66 42 11		48
	15	67 42 10	67 32 10	67 23 10	67 13 10	67 3 10	66 53 10		45
11	18	+67 52 9	+67 42 10	+67 33 9	+67 23 9	+67 13 9	+67 3 9	12	42
	21	68 1 9	67 52 8	67 42 8	67 32 8	67 22 8	67 12 8		39
	24	68 10 8	68 0 8	67 50 8	67 40 8	67 30 8	67 20 8		36
	27	68 18 7	68 8 7	67 58 7	67 48 7	67 38 8	67 28 8		33
	30	68 25 7	68 15 7	68 5 7	67 55 7	67 46 6	67 36 6		30
11	33	+68 32 6	+68 22 6	+68 12 6	+68 2 6	+67 52 6	+67 42 6	12	27
	36	68 38 5	68 28 5	68 18 5	68 8 5	67 58 5	67 48 5		24
	39	68 43 4	68 33 5	68 23 5	68 13 5	68 3 5	67 53 5		21
	42	68 47 4	68 38 5	68 28 5	68 17 4	68 8 5	67 58 5		18
	45	68 51 3	68 41 3	68 32 4	68 21 4	68 11 3	68 1 3		15
11	48	+68 54 3	+68 44 3	+68 35 3	+68 24 3	+68 14 3	+68 4 3	12	12
	51	68 56 2	68 47 3	68 37 2	68 27 3	68 17 3	68 7 3		9
	54	68 58 1	68 49 0	68 39 1	68 29 2	68 19 2	68 9 2		6
11	57	68 59 1	68 49 1	68 40 1	68 30 1	68 20 1	68 10 1		3
12	0	+69 0 1	+68 50 1	+68 40 0	+68 30 0	+68 20 0	+68 10 0	12	0

TABLE Ia.

Table I has been computed for an altitude of 45°. For other altitudes, corrections taken from the following table may be applied when the desired degree of accuracy requires it.

Altitude.		10°	20°	30°	40°	50°	60°	70°	Altitude.	
H. A.									H. A.	
h	h	"	"	"	"	"	"	"	h	h
0	12	0	0	0	0	0	0	0	12	24
1	11	- 2	- 2	- 1	0	0	+ 2	+ 5	13	23
2	10	8	7	4	- 2	+ 2	8	18	14	22
3	9	17	13	9	3	4	15	36	15	21
4	8	25	20	13	5	6	23	54	16	20
5	7	32	24	16	6	7	28	67	17	19
6	6	- 34	- 26	- 17	- 7	+ 8	+ 30	+ 72	18	18

TO BE

FROM A

TIME INTERVAL.

TO BE

FROM A SIDEREAL TIME

■

**TABLE II.—SIDEREAL INTO MEAN SOLAR TIME.  
TO BE SUBTRACTED FROM A SIDEREAL TIME INTERVAL.**

TABLE III.—MEAN SOLAR INTO SIDEREAL TIME. 689  
 TO BE ADDED TO A MEAN TIME INTERVAL.



TO BE ADDED TO A MEAN TIME INTERVAL.

Mean Solar.	8 <sup>h</sup>	9 <sup>h</sup>	10 <sup>h</sup>	11 <sup>h</sup>	12 <sup>h</sup>	13 <sup>h</sup>	14 <sup>h</sup>	15 <sup>h</sup>	For Seconds.	
m	m s	m s	m s	m s	m s	m s	m s	m s	s	s
0	1 18.852	1 28.708	1 38.565	1 48.421	1 58.278	2 8.134	2 17.991	2 27.847	0	0.000
1	1 19.016	1 28.873	1 38.729	1 48.585	1 58.442	2 8.298	2 18.155	2 28.011	1	0.003
2	1 19.180	1 29.037	1 38.893	1 48.750	1 58.606	2 8.463	2 18.319	2 28.176	2	0.005
3	1 19.345	1 29.201	1 39.058	1 48.914	1 58.771	2 8.627	2 18.483	2 28.340	3	0.008
4	1 19.509	1 29.365	1 39.222	1 49.078	1 58.935	2 8.791	2 18.648	2 28.504	4	0.011
5	1 19.673	1 29.530	1 39.386	1 49.243	1 59.099	2 8.956	2 18.812	2 28.668	5	0.014
6	1 19.837	1 29.694	1 39.550	1 49.407	1 59.263	2 9.120	2 18.976	2 28.833	6	0.016
7	1 20.002	1 29.858	1 39.715	1 49.571	1 59.428	2 9.284	2 19.141	2 28.997	7	0.019
8	1 20.166	1 30.022	1 39.879	1 49.735	1 59.592	2 9.448	2 19.305	2 29.161	8	0.022
9	1 20.330	1 30.187	1 40.043	1 49.900	1 59.756	2 9.613	2 19.469	2 29.326	9	0.025
10	1 20.495	1 30.351	1 40.207	1 50.064	1 59.920	2 9.777	2 19.633	2 29.490	10	0.027
11	1 20.659	1 30.515	1 40.372	1 50.228	2 0.085	2 9.941	2 19.798	2 29.654	11	0.030
12	1 20.823	1 30.680	1 40.536	1 50.393	2 0.249	2 10.105	2 19.962	2 29.818	12	0.033
13	1 20.987	1 30.844	1 40.700	1 50.557	2 0.413	2 10.270	2 20.126	2 29.983	13	0.036
14	1 21.152	1 31.008	1 40.865	1 50.721	2 0.578	2 10.434	2 20.290	2 30.147	14	0.038
15	1 21.316	1 31.172	1 41.029	1 50.885	2 0.742	2 10.598	2 20.455	2 30.311	15	0.041
16	1 21.480	1 31.337	1 41.193	1 51.050	2 0.906	2 10.763	2 20.619	2 30.476	16	0.044
17	1 21.644	1 31.501	1 41.357	1 51.214	2 1.070	2 10.927	2 20.783	2 30.640	17	0.047
18	1 21.809	1 31.665	1 41.522	1 51.378	2 1.235	2 11.091	2 20.948	2 30.804	18	0.049
19	1 21.973	1 31.829	1 41.686	1 51.542	2 1.399	2 11.255	2 21.112	2 30.968	19	0.052
20	1 22.137	1 31.994	1 41.850	1 51.707	2 1.563	2 11.420	2 21.276	2 31.133	20	0.055
21	1 22.302	1 32.158	1 42.015	1 51.871	2 1.727	2 11.584	2 21.440	2 31.297	21	0.057
22	1 22.466	1 32.322	1 42.179	1 52.035	2 1.892	2 11.748	2 21.605	2 31.461	22	0.060
23	1 22.630	1 32.487	1 42.343	1 52.200	2 2.056	2 11.912	2 21.769	2 31.625	23	0.063
24	1 22.794	1 32.651	1 42.507	1 52.364	2 2.220	2 12.077	2 21.933	2 31.790	24	0.066
25	1 22.959	1 32.815	1 42.672	1 52.528	2 2.385	2 12.241	2 22.098	2 31.954	25	0.068
26	1 23.123	1 32.979	1 42.836	1 52.692	2 2.549	2 12.405	2 22.262	2 32.118	26	0.071
27	1 23.287	1 33.144	1 43.000	1 52.857	2 2.713	2 12.570	2 22.426	2 32.283	27	0.074
28	1 23.451	1 33.308	1 43.164	1 53.021	2 2.877	2 12.734	2 22.590	2 32.447	28	0.077
29	1 23.616	1 33.472	1 43.329	1 53.185	2 3.042	2 12.898	2 22.755	2 32.611	29	0.079
30	1 23.780	1 33.637	1 43.493	1 53.349	2 3.206	2 13.062	2 22.919	2 32.775	30	0.082
31	1 23.944	1 33.801	1 43.657	1 53.514	2 3.370	2 13.227	2 23.083	2 32.940	31	0.085
32	1 24.109	1 33.965	1 43.822	1 53.678	2 3.534	2 13.391	2 23.247	2 33.104	32	0.088
33	1 24.273	1 34.129	1 43.986	1 53.842	2 3.699	2 13.555	2 23.412	2 33.268	33	0.090
34	1 24.437	1 34.294	1 44.150	1 54.007	2 3.863	2 13.720	2 23.576	2 33.432	34	0.093
35	1 24.601	1 34.458	1 44.314	1 54.171	2 4.027	2 13.884	2 23.740	2 33.597	35	0.096
36	1 24.766	1 34.622	1 44.479	1 54.335	2 4.192	2 14.048	2 23.905	2 33.761	36	0.099
37	1 24.930	1 34.786	1 44.643	1 54.499	2 4.356	2 14.212	2 24.069	2 33.925	37	0.101
38	1 25.094	1 34.951	1 44.807	1 54.664	2 4.520	2 14.377	2 24.233	2 34.090	38	0.104
39	1 25.259	1 35.115	1 44.971	1 54.828	2 4.684	2 14.541	2 24.397	2 34.254	39	0.107
40	1 25.423	1 35.279	1 45.136	1 54.992	2 4.849	2 14.705	2 24.562	2 34.418	40	0.110
41	1 25.587	1 35.444	1 45.300	1 55.156	2 5.013	2 14.869	2 24.726	2 34.582	41	0.112
42	1 25.751	1 35.608	1 45.464	1 55.321	2 5.177	2 15.034	2 24.890	2 34.747	42	0.115
43	1 25.916	1 35.772	1 45.629	1 55.485	2 5.342	2 15.198	2 25.054	2 34.911	43	0.118
44	1 26.080	1 35.936	1 45.793	1 55.649	2 5.506	2 15.362	2 25.219	2 35.075	44	0.120
45	1 26.244	1 36.101	1 45.957	1 55.814	2 5.670	2 15.527	2 25.383	2 35.239	45	0.123
46	1 26.408	1 36.265	1 46.121	1 55.978	2 5.834	2 15.691	2 25.547	2 35.404	46	0.126
47	1 26.573	1 36.429	1 46.286	1 56.142	2 5.999	2 15.855	2 25.712	2 35.568	47	0.129
48	1 26.737	1 36.593	1 46.450	1 56.306	2 6.163	2 16.019	2 25.876	2 35.732	48	0.131
49	1 26.901	1 36.758	1 46.614	1 56.471	2 6.327	2 16.184	2 26.040	2 35.897	49	0.134
50	1 27.066	1 36.922	1 46.778	1 56.635	2 6.491	2 16.348	2 26.204	2 36.061	50	0.137
51	1 27.230	1 37.086	1 46.943	1 56.799	2 6.656	2 16.512	2 26.369	2 36.225	51	0.140
52	1 27.394	1 37.251	1 47.107	1 56.964	2 6.820	2 16.676	2 26.533	2 36.389	52	0.142
53	1 27.558	1 37.415	1 47.271	1 57.128	2 6.984	2 16.841	2 26.697	2 36.554	53	0.145
54	1 27.723	1 37.579	1 47.436	1 57.292	2 7.149	2 17.005	2 26.861	2 36.718	54	0.148
55	1 27.887	1 37.743	1 47.600	1 57.456	2 7.313	2 17.169	2 27.026	2 36.882	55	0.151
56	1 28.051	1 37.908	1 47.764	1 57.621	2 7.477	2 17.334	2 27.190	2 37.047	56	0.153
57	1 28.215	1 38.072	1 47.928	1 57.785	2 7.641	2 17.498	2 27.354	2 37.211	57	0.156
58	1 28.380	1 38.236	1 48.093	1 57.949	2 7.806	2 17.662	2 27.519	2 37.375	58	0.159
59	1 28.544	1 38.400	1 48.257	1 58.113	2 7.970	2 17.826	2 27.683	2 37.539	59	0.162
Mean Solar.	8 <sup>h</sup>	9 <sup>h</sup>	10 <sup>h</sup>	11 <sup>h</sup>	12 <sup>h</sup>	13 <sup>h</sup>	14 <sup>h</sup>	15 <sup>h</sup>	For Seconds.	

(Eph 15)

TO BE ADDED TO A MEAN TIME INTERVAL.

Mean Solar.	16 <sup>h</sup>	17 <sup>h</sup>	18 <sup>h</sup>	19 <sup>h</sup>	20 <sup>h</sup>	21 <sup>h</sup>	22 <sup>h</sup>	23 <sup>h</sup>	For Seconds.	
m	m s	m s	m s	m s	m s	m s	m s	m s	s	s
0	2 37.704	2 47.560	2 57.417	3 7.273	3 17.129	3 26.986	3 36.842	3 46.699	0	0.000
1	2 37.868	2 47.724	2 57.581	3 7.437	3 17.294	3 27.150	3 37.007	3 46.863	1	0.003
2	2 38.032	2 47.889	2 57.745	3 7.602	3 17.458	3 27.315	3 37.171	3 47.027	2	0.005
3	2 38.196	2 48.053	2 57.909	3 7.766	3 17.622	3 27.479	3 37.335	3 47.192	3	0.008
4	2 38.361	2 48.217	2 58.074	3 7.930	3 17.787	3 27.643	3 37.500	3 47.356	4	0.011
5	2 38.525	2 48.381	2 58.238	3 8.094	3 17.951	3 27.807	3 37.664	3 47.520	5	0.014
6	2 38.689	2 48.546	2 58.402	3 8.259	3 18.115	3 27.972	3 37.828	3 47.685	6	0.016
7	2 38.854	2 48.710	2 58.566	3 8.423	3 18.279	3 28.136	3 37.992	3 47.849	7	0.019
8	2 39.018	2 48.874	2 58.731	3 8.587	3 18.444	3 28.300	3 38.157	3 48.013	8	0.022
9	2 39.182	2 49.039	2 58.895	3 8.751	3 18.608	3 28.464	3 38.321	3 48.177	9	0.025
10	2 39.346	2 49.203	2 59.059	3 8.916	3 18.772	3 28.629	3 38.485	3 48.342	10	0.027
11	2 39.511	2 49.367	2 59.224	3 9.080	3 18.937	3 28.793	3 38.649	3 48.506	11	0.030
12	2 39.675	2 49.531	2 59.388	3 9.244	3 19.101	3 28.957	3 38.814	3 48.670	12	0.033
13	2 39.839	2 49.696	2 59.552	3 9.409	3 19.265	3 29.122	3 38.978	3 48.834	13	0.036
14	2 40.003	2 49.860	2 59.716	3 9.573	3 19.429	3 29.286	3 39.142	3 48.999	14	0.038
15	2 40.168	2 50.024	2 59.881	3 9.737	3 19.594	3 29.450	3 39.307	3 49.163	15	0.041
16	2 40.332	2 50.188	3 0.045	3 9.901	3 19.758	3 29.614	3 39.471	3 49.327	16	0.044
17	2 40.496	2 50.353	3 0.209	3 10.066	3 19.922	3 29.779	3 39.635	3 49.492	17	0.047
18	2 40.661	2 50.517	3 0.373	3 10.230	3 20.086	3 29.943	3 39.799	3 49.656	18	0.049
19	2 40.825	2 50.681	3 0.538	3 10.394	3 20.251	3 30.107	3 39.964	3 49.820	19	0.052
20	2 40.989	2 50.846	3 0.702	3 10.559	3 20.415	3 30.271	3 40.128	3 49.984	20	0.055
21	2 41.153	2 51.010	3 0.866	3 10.723	3 20.579	3 30.436	3 40.292	3 50.149	21	0.057
22	2 41.318	2 51.174	3 1.031	3 10.887	3 20.744	3 30.600	3 40.456	3 50.313	22	0.060
23	2 41.482	2 51.338	3 1.195	3 11.051	3 20.908	3 30.764	3 40.621	3 50.477	23	0.063
24	2 41.646	2 51.503	3 1.359	3 11.216	3 21.072	3 30.929	3 40.785	3 50.642	24	0.066
25	2 41.810	2 51.667	3 1.523	3 11.380	3 21.236	3 31.093	3 40.949	3 50.806	25	0.068
26	2 41.975	2 51.831	3 1.688	3 11.544	3 21.401	3 31.257	3 41.114	3 50.970	26	0.071
27	2 42.139	2 51.995	3 1.852	3 11.708	3 21.565	3 31.421	3 41.278	3 51.134	27	0.074
28	2 42.303	2 52.160	3 2.016	3 11.873	3 21.729	3 31.586	3 41.442	3 51.299	28	0.077
29	2 42.468	2 52.324	3 2.181	3 12.037	3 21.893	3 31.750	3 41.606	3 51.463	29	0.079
30	2 42.632	2 52.488	3 2.345	3 12.201	3 22.058	3 31.914	3 41.771	3 51.627	30	0.082
31	2 42.796	2 52.653	3 2.509	3 12.366	3 22.222	3 32.078	3 41.935	3 51.791	31	0.085
32	2 42.960	2 52.817	3 2.673	3 12.530	3 22.386	3 32.243	3 42.099	3 51.956	32	0.088
33	2 43.125	2 52.981	3 2.838	3 12.694	3 22.551	3 32.407	3 42.264	3 52.120	33	0.090
34	2 43.289	2 53.145	3 3.002	3 12.858	3 22.715	3 32.571	3 42.428	3 52.284	34	0.093
35	2 43.453	2 53.310	3 3.166	3 13.023	3 22.879	3 32.736	3 42.592	3 52.449	35	0.096
36	2 43.617	2 53.474	3 3.330	3 13.187	3 23.043	3 32.900	3 42.756	3 52.613	36	0.099
37	2 43.782	2 53.638	3 3.495	3 13.351	3 23.208	3 33.064	3 42.921	3 52.777	37	0.101
38	2 43.946	2 53.803	3 3.659	3 13.515	3 23.372	3 33.228	3 43.085	3 52.941	38	0.104
39	2 44.110	2 53.967	3 3.823	3 13.680	3 23.536	3 33.393	3 43.249	3 53.106	39	0.107
40	2 44.275	2 54.131	3 3.988	3 13.844	3 23.700	3 33.557	3 43.413	3 53.270	40	0.110
41	2 44.439	2 54.295	3 4.152	3 14.008	3 23.865	3 33.721	3 43.578	3 53.434	41	0.112
42	2 44.603	2 54.460	3 4.316	3 14.173	3 24.029	3 33.886	3 43.742	3 53.598	42	0.115
43	2 44.767	2 54.624	3 4.480	3 14.337	3 24.193	3 34.050	3 43.906	3 53.763	43	0.118
44	2 44.932	2 54.788	3 4.645	3 14.501	3 24.358	3 34.214	3 44.071	3 53.927	44	0.120
45	2 45.096	2 54.952	3 4.809	3 14.665	3 24.522	3 34.378	3 44.235	3 54.091	45	0.123
46	2 45.260	2 55.117	3 4.973	3 14.830	3 24.686	3 34.543	3 44.399	3 54.256	46	0.126
47	2 45.425	2 55.281	3 5.137	3 14.994	3 24.850	3 34.707	3 44.563	3 54.420	47	0.129
48	2 45.589	2 55.445	3 5.302	3 15.158	3 25.015	3 34.871	3 44.728	3 54.584	48	0.131
49	2 45.753	2 55.610	3 5.466	3 15.322	3 25.179	3 35.035	3 44.892	3 54.748	49	0.134
50	2 45.917	2 55.774	3 5.630	3 15.487	3 25.343	3 35.200	3 45.056	3 54.913	50	0.137
51	2 46.082	2 55.938	3 5.795	3 15.651	3 25.508	3 35.364	3 45.220	3 55.077	51	0.140
52	2 46.246	2 56.102	3 5.959	3 15.815	3 25.672	3 35.528	3 45.385	3 55.241	52	0.142
53	2 46.410	2 56.267	3 6.123	3 15.980	3 25.836	3 35.693	3 45.549	3 55.405	53	0.145
54	2 46.574	2 56.431	3 6.287	3 16.144	3 26.000	3 35.857	3 45.713	3 55.570	54	0.148
55	2 46.739	2 56.595	3 6.452	3 16.308	3 26.165	3 36.021	3 45.878	3 55.734	55	0.151
56	2 46.903	2 56.759	3 6.616	3 16.472	3 26.329	3 36.185	3 46.042	3 55.898	56	0.153
57	2 47.067	2 56.924	3 6.780	3 16.637	3 26.493	3 36.350	3 46.206	3 56.063	57	0.156
58	2 47.232	2 57.088	3 6.944	3 16.801	3 26.657	3 36.514	3 46.370	3 56.227	58	0.159
59	2 47.396	2 57.252	3 7.109	3 16.965	3 26.822	3 36.678	3 46.535	3 56.391	59	0.162
Mean Solar.	16 <sup>h</sup>	17 <sup>h</sup>	18 <sup>h</sup>	19 <sup>h</sup>	20 <sup>h</sup>	21 <sup>h</sup>	22 <sup>h</sup>	23 <sup>h</sup>	For Seconds.	

[Eph 15]

AZIMUTH OF POLARIS AT ALL HOUR ANGLES. 1915.

[For hour angles 0<sup>h</sup> to 12<sup>h</sup> the star is west of north, and for hour angles 12<sup>h</sup> to 24<sup>h</sup> it is east of north.]

Lat. H. A.		10°	15°	20°	25°	30°	35°	40°	45°	50°	Lat. H. A.		
h	m	°	'	°	'	°	'	°	'	°	'	h	m
0	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	24	0
	12	0	3.7	0	3.7	0	4.2	0	4.4	0	5.2	23	48
	24	0	7.3	0	7.5	0	8.4	0	8.9	0	10.3		36
	36	0	10.9	0	11.2	0	12.5	0	13.3	0	14.2		24
	48	0	14.5	0	14.8	0	15.9	0	17.6	0	18.9		12
1	0	0	18.1	0	18.5	0	19.8	0	22.0	0	23.5	23	0
	12	0	21.6	0	22.0	0	23.6	0	26.2	0	28.1	22	48
	24	0	25.0	0	25.6	0	27.3	0	30.4	0	32.6		36
	36	0	28.4	0	29.0	0	31.0	0	32.6	0	34.5		24
	48	0	31.7	0	32.4	0	33.4	0	36.3	0	38.5		12
2	0	0	34.9	0	35.7	0	38.1	0	42.4	0	45.4	22	0
	12	0	38.0	0	38.8	0	41.5	0	46.1	0	49.4	21	48
	24	0	41.0	0	41.9	0	43.2	0	47.0	0	49.8		36
	36	0	43.9	0	44.9	0	46.2	0	50.3	0	53.3		24
	48	0	46.7	0	47.7	0	49.1	0	53.4	0	56.6		12
3	0	0	49.4	0	50.4	0	53.9	0	59.8	I	4.1	I	16.7
	12	0	51.9	0	53.0	0	56.6	0	59.3	I	2.8	I	7.3
	24	0	54.2	0	55.4	0	57.0	0	59.2	I	2.0	I	5.6
	36	0	56.5	0	57.6	0	59.3	I	1.6	I	4.5	I	8.3
	48	0	58.5	0	59.7	I	1.5	I	3.8	I	6.8	I	10.8
4	0	I	0.4	I	1.7	I	3.4	I	5.8	I	9.0	I	13.0
	12	I	2.2	I	3.4	I	5.2	I	7.7	I	10.9	I	15.1
	24	I	3.7	I	5.0	I	6.9	I	9.4	I	12.7	I	16.9
	36	I	5.1	I	6.4	I	8.3	I	10.9	I	14.2	I	18.6
	48	I	6.3	I	7.6	I	9.6	I	12.2	I	15.6	I	20.0
5	0	I	7.3	I	8.7	I	10.6	I	13.3	I	16.7	I	21.2
	12	I	8.2	I	9.5	I	11.5	I	14.2	I	17.6	I	22.1
	24	I	8.8	I	10.2	I	12.2	I	14.8	I	18.4	I	22.9
	36	I	9.3	I	10.7	I	12.6	I	15.3	I	18.9	I	23.4
	48	I	9.6	I	10.9	I	12.9	I	15.6	I	19.1	I	23.7
6	0	I	9.6	I	11.0	I	13.0	I	15.7	I	19.2	I	23.7
	12	I	9.5	I	10.9	I	12.8	I	15.5	I	19.0	I	23.6
	24	I	9.2	I	10.6	I	12.5	I	15.2	I	18.7	I	23.1
	36	I	8.7	I	10.1	I	12.0	I	14.6	I	18.1	I	22.5
	48	I	8.1	I	9.4	I	11.3	I	13.9	I	17.3	I	21.6
7	0	I	7.2	I	8.5	I	10.4	I	12.9	I	16.3	I	20.6
	12	I	6.2	I	7.4	I	9.2	I	11.8	I	15.0	I	19.3
	24	I	4.9	I	6.2	I	8.0	I	10.4	I	13.6	I	17.8
	36	I	3.5	I	4.7	I	6.5	I	8.9	I	12.0	I	16.1
	48	I	2.0	I	3.1	I	4.8	I	7.1	I	10.2	I	14.1
8	0	I	0.2	I	1.3	I	3.0	I	5.2	I	8.2	I	12.0
	12	0	58.3	0	59.4	I	1.0	I	3.1	I	6.0	I	9.7
	24	0	56.2	0	57.3	0	58.8	I	0.9	I	3.6	I	7.2
	36	0	54.0	0	55.0	0	56.5	0	58.5	I	1.1	I	4.5
	48	0	51.6	0	52.6	0	54.0	0	55.9	0	58.4	I	1.6
9	0	0	49.1	0	50.0	0	51.4	0	53.2	0	55.6	0	58.6
	12	0	46.5	0	47.3	0	48.6	0	50.3	0	52.6	0	55.4
	24	0	43.7	0	44.5	0	45.7	0	47.3	0	49.4	0	52.1
	36	0	40.8	0	41.6	0	42.6	0	44.1	0	46.1	0	48.7
	48	0	37.8	0	38.5	0	39.5	0	40.9	0	42.7	0	45.1
10	0	0	34.7	0	35.3	0	36.3	0	37.5	0	39.2	0	41.4
	12	0	31.5	0	32.1	0	32.9	0	34.1	0	35.6	0	37.5
	24	0	28.2	0	28.7	0	29.5	0	30.5	0	31.9	0	33.6
	36	0	24.9	0	25.3	0	26.0	0	26.9	0	28.1	0	29.6
	48	0	21.5	0	21.8	0	22.4	0	23.2	0	24.2	0	25.5
11	0	0	18.0	0	18.3	0	18.8	0	19.4	0	20.3	0	21.4
	12	0	14.4	0	14.7	0	15.1	0	15.6	0	16.3	0	17.2
	24	0	10.8	0	11.0	0	11.3	0	11.7	0	12.2	0	12.9
	36	0	7.2	0	7.4	0	7.6	0	7.8	0	8.2	0	8.7
	48	0	3.6	0	3.7	0	3.8	0	3.9	0	4.1	0	4.4
12	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0

AZIMUTH OF POLARIS AT ALL HOUR ANGLES, 1915.

For hour angles 0<sup>h</sup> to 12<sup>h</sup> the star is west of north, and for hour angles 12<sup>h</sup> to 24<sup>h</sup> it is east of north.

Lat.		52°	54°	56°	58°	60°	61°	62°	63°	64°	Lat.	
I. A.												H. A.
h m		° '	° '	° '	° '	° '	° '	° '	° '	° '	h m	
0 0		0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	24 0	
12		0 6.0	0 6.3	0 6.6	0 7.0	0 7.4	0 7.7	0 7.9	0 8.2	0 8.5	23 48	
24		0 11.9	0 12.5	0 13.2	0 14.0	0 14.8	0 15.3	0 15.8	0 16.4	0 17.0	36	
36		0 17.9	0 18.8	0 19.8	0 20.9	0 22.2	0 22.9	0 23.7	0 24.6	0 25.5	24	
48		0 23.7	0 24.9	0 26.2	0 27.8	0 29.5	0 30.4	0 31.5	0 32.6	0 33.8	12	
1 0		0 29.5	0 31.0	0 32.6	0 34.5	0 36.7	0 37.9	0 39.2	0 40.6	0 42.1	23 0	
12		0 35.3	0 37.0	0 39.0	0 41.2	0 43.8	0 45.2	0 46.8	0 48.4	0 50.2	22 48	
24		0 40.9	0 42.9	0 45.2	0 47.8	0 50.8	0 52.4	0 54.2	0 56.2	0 58.3	36	
36		0 46.4	0 48.6	0 51.2	0 54.2	0 57.6	0 59.5	1 1.5	1 3.7	1 6.1	24	
48		0 51.7	0 54.3	0 57.2	1 0.4	1 4.2	1 6.3	1 8.6	1 11.1	1 13.7	12	
2 0		0 56.9	0 59.7	1 2.9	1 6.5	1 10.7	1 13.0	1 15.5	1 18.2	1 21.1	22 0	
12		1 2.0	1 5.0	1 8.5	1 12.4	1 16.9	1 19.4	1 22.1	1 25.1	1 28.2	21 48	
24		1 6.8	1 10.1	1 13.8	1 18.0	1 22.9	1 25.6	1 28.5	1 31.7	1 35.1	36	
36		1 11.5	1 15.0	1 19.0	1 23.5	1 28.7	1 31.6	1 34.7	1 38.0	1 41.7	24	
48		1 16.0	1 19.7	1 23.9	1 28.7	1 34.2	1 37.2	1 40.5	1 44.1	1 47.9	12	
3 0		1 20.2	1 24.1	1 28.5	1 33.6	1 39.4	1 42.6	1 46.1	1 49.8	1 53.9	21 0	
12		1 24.2	1 28.3	1 33.0	1 38.2	1 44.3	1 47.7	1 51.3	1 55.2	1 59.5	20 48	
24		1 28.0	1 32.2	1 37.1	1 42.6	1 48.9	1 52.4	1 56.2	2 0.3	2 4.7	36	
36		1 31.5	1 35.9	1 41.0	1 46.7	1 53.2	1 56.9	2 0.8	2 5.0	2 9.6	24	
48		1 34.7	1 39.3	1 44.5	1 50.4	1 57.2	2 1.0	2 5.0	2 9.4	2 14.1	12	
4 0		1 37.7	1 42.4	1 47.8	1 53.9	2 0.8	2 4.7	2 8.9	2 13.4	2 18.3	20 0	
12		1 40.4	1 45.3	1 50.8	1 57.0	2 4.1	2 8.1	2 12.4	2 17.0	2 22.0	19 48	
24		1 42.8	1 47.8	1 53.4	1 59.8	2 7.1	2 11.1	2 15.5	2 20.2	2 25.3	36	
36		1 45.0	1 50.0	1 55.7	2 2.2	2 9.6	2 13.8	2 18.2	2 23.0	2 28.2	24	
48		1 46.8	1 51.9	1 57.7	2 4.3	2 11.8	2 16.0	2 20.5	2 25.4	2 30.6	12	
5 0		1 48.3	1 53.5	1 59.4	2 6.0	2 13.6	2 17.9	2 22.4	2 27.4	2 32.7	19 0	
12		1 49.5	1 54.8	2 0.7	2 7.4	2 15.1	2 19.4	2 24.0	2 28.9	2 34.3	18 48	
24		1 50.5	1 55.7	2 1.7	2 8.5	2 16.2	2 20.5	2 25.1	2 30.0	2 35.4	36	
36		1 51.1	1 56.4	2 2.3	2 9.1	2 16.8	2 21.2	2 25.8	2 30.8	2 36.2	24	
48		1 51.4	1 56.7	2 2.6	2 9.5	2 17.2	2 21.5	2 26.1	2 31.1	2 36.5	12	
6 0		1 51.4	1 56.7	2 2.6	2 9.4	2 17.1	2 21.4	2 26.0	2 31.0	2 36.4	18 0	
12		1 51.1	1 56.4	2 2.2	2 9.0	2 16.7	2 20.9	2 25.5	2 30.5	2 35.8	17 48	
24		1 50.5	1 55.7	2 1.6	2 8.3	2 15.9	2 20.1	2 24.6	2 29.6	2 34.8	36	
36		1 49.6	1 54.8	2 0.5	2 7.2	2 14.7	2 18.9	2 23.4	2 28.2	2 33.5	24	
48		1 48.4	1 53.5	1 59.2	2 5.7	2 13.2	2 17.3	2 21.7	2 26.5	2 31.7	12	
7 0		1 46.9	1 51.9	1 57.6	2 4.0	2 11.3	2 15.3	2 19.7	2 24.4	2 29.5	17 0	
12		1 45.1	1 50.0	1 55.6	2 1.8	2 9.0	2 13.0	2 17.3	2 21.9	2 26.9	16 48	
24		1 43.0	1 47.9	1 53.3	1 59.4	2 6.5	2 10.4	2 14.5	2 19.0	2 23.9	36	
36		1 40.7	1 45.4	1 50.7	1 56.7	2 3.5	2 7.3	2 11.4	2 15.8	2 20.5	24	
48		1 38.1	1 42.7	1 47.8	1 53.6	2 0.3	2 4.0	2 8.0	2 12.2	2 16.8	12	
8 0		1 35.2	1 39.7	1 44.6	1 50.3	1 56.7	2 0.3	2 4.2	2 8.3	2 12.7	16 0	
12		1 32.1	1 36.4	1 41.2	1 46.7	1 52.9	1 56.3	2 0.0	2 4.0	2 8.3	15 48	
24		1 28.8	1 32.9	1 37.5	1 42.7	1 48.7	1 52.0	1 55.6	1 59.4	2 3.5	36	
36		1 25.2	1 29.1	1 33.5	1 38.6	1 44.3	1 47.4	1 50.8	1 54.5	1 58.4	24	
48		1 21.4	1 25.1	1 29.3	1 34.1	1 39.6	1 42.6	1 45.8	1 49.3	1 53.1	12	
9 0		1 17.4	1 20.9	1 24.9	1 29.4	1 34.6	1 37.5	1 40.6	1 43.9	1 47.4	15 0	
12		1 13.1	1 16.5	1 20.3	1 24.6	1 29.5	1 32.2	1 35.1	1 38.2	1 41.6	14 48	
24		1 8.7	1 11.9	1 15.4	1 19.4	1 24.1	1 26.6	1 29.3	1 32.2	1 35.4	36	
36		1 4.1	1 7.1	1 10.4	1 14.1	1 18.4	1 20.8	1 23.3	1 26.0	1 29.0	24	
48		0 59.4	1 2.1	1 5.1	1 8.6	1 12.6	1 14.8	1 17.1	1 19.6	1 22.4	12	
10 0		0 54.5	0 57.0	0 59.8	1 2.9	1 6.6	1 8.6	1 10.8	1 13.1	1 15.6	14 0	
12		0 49.4	0 51.7	0 54.2	0 57.1	1 0.4	1 2.2	1 4.2	1 6.3	1 8.5	13 48	
24		0 44.2	0 46.3	0 48.5	0 51.1	0 54.1	0 55.7	0 57.5	0 59.3	1 1.3	36	
36		0 39.0	0 40.7	0 42.7	0 45.0	0 47.6	0 49.0	0 50.6	0 52.2	0 54.0	24	
48		0 33.6	0 35.1	0 36.8	0 38.8	0 41.0	0 42.3	0 43.6	0 45.0	0 46.5	12	
11 0		0 28.1	0 29.4	0 30.8	0 32.5	0 34.3	0 35.4	0 36.5	0 37.7	0 38.9	13 0	
12		0 22.6	0 23.6	0 24.8	0 26.1	0 27.6	0 28.4	0 29.3	0 30.2	0 31.2	12 48	
24		0 17.0	0 17.8	0 18.6	0 19.6	0 20.7	0 21.4	0 22.0	0 22.8	0 23.5	36	
36		0 11.4	0 11.9	0 12.4	0 13.1	0 13.8	0 14.3	0 14.7	0 15.2	0 15.7	24	
48		0 5.7	0 5.9	0 6.2	0 6.6	0 6.9	0 7.1	0 7.4	0 7.6	0 7.9	12	
12 0		0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	12 0	



AZIMUTH OF POLARIS AT ELONGATION, 1915.

Decl. Lat.							Variation for—	
	88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	r' of Lat.	r'' of l.
0	0	0	0	0	0	0	"	"
5 0	1 9 15.8	1 9 5.8	1 8 55.7	1 8 45.7	1 8 35.7	1 8 25.6	+0.10	-1.00
5 20	1 9 18.0	1 9 8.0	1 8 57.9	1 8 47.9	1 8 37.8	1 8 27.8	0.11	1.00
5 40	1 9 20.3	1 9 10.3	1 9 0.2	1 8 50.2	1 8 40.1	1 8 30.1	0.12	1.00
6 0	1 9 22.8	1 9 12.8	1 9 2.7	1 8 52.6	1 8 42.6	1 8 32.5	0.13	1.01
6 20	1 9 25.4	1 9 15.4	1 9 5.3	1 8 55.2	1 8 45.2	1 8 35.1	0.14	1.01
6 40	1 9 28.2	1 9 18.1	1 9 8.0	1 8 58.0	1 8 47.9	1 8 37.8	+0.14	-1.01
7 0	1 9 31.1	1 9 21.0	1 9 10.9	1 9 0.9	1 8 50.8	1 8 40.7	0.15	1.01
7 20	1 9 34.1	1 9 24.1	1 9 14.0	1 9 3.9	1 8 53.8	1 8 43.7	0.16	1.01
7 40	1 9 37.3	1 9 27.3	1 9 17.2	1 9 7.1	1 8 57.0	1 8 46.9	0.16	1.01
8 0	1 9 40.7	1 9 30.6	1 9 20.5	1 9 10.4	1 9 0.3	1 8 50.2	0.17	1.01
8 20	1 9 44.2	1 9 34.1	1 9 24.0	1 9 13.9	1 9 3.8	1 8 53.6	+0.18	-1.01
8 40	1 9 47.8	1 9 37.7	1 9 27.6	1 9 17.5	1 9 7.4	1 8 57.2	0.18	1.01
9 0	1 9 51.6	1 9 41.5	1 9 31.4	1 9 21.2	1 9 11.1	1 9 1.0	0.19	1.01
9 20	1 9 55.5	1 9 45.4	1 9 35.3	1 9 25.2	1 9 15.0	1 9 4.9	0.20	1.01
9 40	1 9 59.6	1 9 49.5	1 9 39.4	1 9 29.2	1 9 19.1	1 9 8.9	0.21	1.01
10 0	1 10 3.8	1 9 53.7	1 9 43.6	1 9 33.4	1 9 23.3	1 9 13.1	+0.22	-1.02
10 20	1 10 8.2	1 9 58.1	1 9 47.9	1 9 37.8	1 9 27.6	1 9 17.4	0.22	1.02
10 40	1 10 12.8	1 10 2.6	1 9 52.4	1 9 42.3	1 9 32.1	1 9 21.9	0.23	1.02
11 0	1 10 17.5	1 10 7.3	1 9 57.1	1 9 46.9	1 9 36.8	1 9 26.6	0.24	1.02
11 20	1 10 22.3	1 10 12.1	1 10 1.9	1 9 51.7	1 9 41.6	1 9 31.4	0.24	1.02
11 40	1 10 27.3	1 10 17.1	1 10 6.9	1 9 56.7	1 9 46.5	1 9 36.3	+0.25	-1.02
12 0	1 10 32.5	1 10 22.3	1 10 12.1	1 10 1.8	1 9 51.6	1 9 41.4	0.26	1.02
12 20	1 10 37.8	1 10 27.6	1 10 17.3	1 10 7.1	1 9 56.9	1 9 46.6	0.27	1.02
12 40	1 10 43.2	1 10 33.0	1 10 22.8	1 10 12.5	1 10 2.3	1 9 52.0	0.28	1.03
13 0	1 10 49.0	1 10 38.7	1 10 28.4	1 10 18.1	1 10 7.9	1 9 57.6	0.29	1.03
13 20	1 10 54.7	1 10 44.4	1 10 34.2	1 10 23.9	1 10 13.6	1 10 3.3	+0.29	-1.03
13 40	1 11 0.6	1 10 50.4	1 10 40.1	1 10 29.8	1 10 19.5	1 10 9.2	0.30	1.03
14 0	1 11 6.7	1 10 56.5	1 10 46.2	1 10 35.8	1 10 25.5	1 10 15.2	0.31	1.03
14 20	1 11 13.0	1 11 2.7	1 10 52.4	1 10 42.1	1 10 31.7	1 10 21.4	0.32	1.03
14 40	1 11 19.4	1 11 9.1	1 10 58.8	1 10 48.4	1 10 38.1	1 10 27.8	0.32	1.03
15 0	1 11 26.0	1 11 15.7	1 11 5.4	1 10 55.0	1 10 44.6	1 10 34.3	+0.33	-1.03
15 20	1 11 32.8	1 11 22.5	1 11 12.1	1 11 1.7	1 10 51.4	1 10 41.0	0.34	1.04
15 40	1 11 39.7	1 11 29.4	1 11 19.0	1 11 8.6	1 10 58.2	1 10 47.8	0.35	1.04
16 0	1 11 46.8	1 11 36.5	1 11 26.1	1 11 15.7	1 11 5.2	1 10 54.8	0.36	1.04
16 20	1 11 54.1	1 11 43.7	1 11 33.3	1 11 22.9	1 11 12.4	1 11 2.0	0.37	1.04
16 40	1 12 1.5	1 11 51.1	1 11 40.7	1 11 30.3	1 11 19.8	1 11 9.4	+0.38	-1.04
17 0	1 12 9.2	1 11 58.7	1 11 48.3	1 11 37.8	1 11 27.4	1 11 16.9	0.38	1.05
17 20	1 12 16.9	1 12 6.5	1 11 56.0	1 11 45.5	1 11 35.1	1 11 24.6	0.39	1.05
17 40	1 12 24.9	1 12 14.4	1 12 4.0	1 11 53.5	1 11 43.0	1 11 32.5	0.40	1.05
18 0	1 12 33.1	1 12 22.6	1 12 12.1	1 12 1.5	1 11 51.0	1 11 40.5	0.41	1.05
18 20	1 12 41.4	1 12 30.9	1 12 20.3	1 12 9.8	1 11 59.3	1 11 48.7	+0.42	-1.05
18 40	1 12 50.0	1 12 39.4	1 12 28.8	1 12 18.2	1 12 7.7	1 11 57.1	0.43	1.06
19 0	1 12 58.6	1 12 48.0	1 12 37.4	1 12 26.9	1 12 16.3	1 12 5.7	0.44	1.06
19 20	1 13 7.4	1 12 56.8	1 12 46.2	1 12 35.6	1 12 25.1	1 12 14.5	0.45	1.06
19 40	1 13 16.5	1 13 5.9	1 12 55.3	1 12 44.6	1 12 34.0	1 12 23.4	0.46	1.06
20 0	1 13 25.7	1 13 15.1	1 13 4.4	1 12 53.8	1 12 43.2	1 12 32.5	+0.46	-1.06
20 20	1 13 35.2	1 13 24.5	1 13 13.8	1 13 3.2	1 12 52.5	1 12 41.8	0.47	1.07
20 40	1 13 44.7	1 13 34.1	1 13 23.4	1 13 12.7	1 13 2.0	1 12 51.3	0.48	1.07
21 0	1 13 54.6	1 13 43.9	1 13 33.2	1 13 22.5	1 13 11.7	1 13 1.0	0.49	1.07
21 20	1 14 4.6	1 13 53.9	1 13 43.1	1 13 32.4	1 13 21.6	1 13 10.9	0.50	1.07
21 40	1 14 14.7	1 14 4.0	1 13 53.3	1 13 42.5	1 13 31.7	1 13 21.0	+0.51	-1.08
22 0	1 14 25.2	1 14 14.4	1 14 3.6	1 13 52.8	1 13 42.0	1 13 31.2	0.52	1.08
22 20	1 14 35.8	1 14 25.0	1 14 14.2	1 14 3.4	1 13 52.5	1 13 41.7	0.53	1.08
22 40	1 14 46.5	1 14 35.7	1 14 24.9	1 14 14.1	1 14 3.2	1 13 52.4	0.54	1.08
23 0	1 14 57.5	1 14 46.7	1 14 35.9	1 14 25.0	1 14 14.1	1 14 3.3	0.55	1.09
23 20	1 15 8.8	1 14 57.9	1 14 47.0	1 14 36.1	1 14 25.2	1 14 14.3	+0.56	-1.09
23 40	1 15 20.2	1 15 9.3	1 14 58.4	1 14 47.5	1 14 36.5	1 14 25.6	0.57	1.09
24 0	1 15 31.8	1 15 20.9	1 15 10.0	1 14 59.0	1 14 48.1	1 14 37.1	0.58	1.09
24 20	1 15 43.7	1 15 32.7	1 15 21.8	1 15 10.8	1 14 59.8	1 14 48.8	0.60	1.10
24 40	1 15 55.8	1 15 44.8	1 15 33.8	1 15 22.8	1 15 11.8	1 15 0.8	0.61	1.10
25 0	1 16 8.0	1 15 57.0	1 15 46.0	1 15 34.9	1 15 23.9	1 15 12.9	+0.62	-1.10

AZIMUTH OF POLARIS AT ELONGATION, 1915.

Decl. t.	88° 51' 0''			88° 51' 10''			88° 51' 20''			88° 51' 30''			88° 51' 40''			88° 51' 50''			Variation for—	
																			r' of Lat.	r'' of δ.
° ,	° ,	''		° ,	''		° ,	''		° ,	''		° ,	''		° ,	''		''	''
25 0	1 16	8.0		1 15	57.0		1 15	46.0		1 15	34.9		1 15	23.9		1 15	12.9		+0.62	−1.10
25 20	1 16	20.5		1 16	9.5		1 15	58.4		1 15	47.4		1 15	36.3		1 15	25.2		0.63	1.11
25 40	1 16	33.3		1 16	22.2		1 16	11.1		1 16	0.0		1 15	48.9		1 15	37.8		0.64	1.11
26 0	1 16	46.2		1 16	35.1		1 16	24.0		1 16	12.9		1 16	1.7		1 15	50.6		0.65	1.11
26 20	1 16	59.4		1 16	48.3		1 16	37.1		1 16	26.0		1 16	14.8		1 16	3.6		0.66	1.11
26 40	1 17	12.8		1 17	1.7		1 16	50.5		1 16	39.3		1 16	28.1		1 16	16.9		+0.68	−1.12
27 0	1 17	26.5		1 17	15.3		1 17	4.1		1 16	52.8		1 16	41.6		1 16	30.4		0.69	1.12
27 20	1 17	40.4		1 17	29.2		1 17	17.9		1 17	6.6		1 16	55.4		1 16	44.1		0.70	1.13
27 40	1 17	54.5		1 17	43.3		1 17	32.0		1 17	20.7		1 17	9.4		1 16	58.1		0.71	1.13
28 0	1 18	8.9		1 17	57.6		1 17	46.3		1 17	34.9		1 17	23.6		1 17	12.3		0.72	1.13
28 20	1 18	23.5		1 18	12.2		1 18	0.8		1 17	49.5		1 17	38.1		1 17	26.8		+0.74	−1.14
28 40	1 18	38.4		1 18	27.0		1 18	15.6		1 18	4.3		1 17	52.8		1 17	41.5		0.75	1.14
29 0	1 18	53.6		1 18	42.2		1 18	30.7		1 18	19.3		1 18	7.8		1 17	56.4		0.76	1.14
29 20	1 19	8.9		1 18	57.5		1 18	46.0		1 18	34.6		1 18	23.1		1 18	11.6		0.77	1.15
29 40	1 19	24.6		1 19	13.1		1 19	1.6		1 18	50.1		1 18	38.6		1 18	27.1		0.79	1.15
30 0	1 19	40.5		1 19	29.0		1 19	17.5		1 19	5.9		1 18	54.4		1 18	42.8		+0.80	−1.15
30 10	1 19	48.6		1 19	37.1		1 19	25.5		1 19	13.9		1 19	2.4		1 18	50.8		0.81	1.16
30 20	1 19	56.7		1 19	45.2		1 19	33.6		1 19	22.0		1 19	10.4		1 18	58.8		0.81	1.16
30 30	1 20	4.9		1 19	53.4		1 19	41.8		1 19	30.1		1 19	18.5		1 19	6.9		0.82	1.16
30 40	1 20	13.2		1 20	1.6		1 19	50.0		1 19	38.4		1 19	26.7		1 19	15.1		0.83	1.16
30 50	1 20	21.5		1 20	9.9		1 19	58.3		1 19	46.6		1 19	35.0		1 19	23.3		+0.84	−1.16
31 0	1 20	30.0		1 20	18.3		1 20	6.6		1 19	55.0		1 19	43.3		1 19	31.6		0.84	1.17
31 10	1 20	38.4		1 20	26.8		1 20	15.1		1 20	3.4		1 19	51.7		1 19	40.0		0.85	1.17
31 20	1 20	47.0		1 20	35.3		1 20	23.6		1 20	11.9		1 20	0.2		1 19	48.5		0.86	1.17
31 30	1 20	55.6		1 20	43.9		1 20	32.2		1 20	20.4		1 20	8.7		1 19	57.0		0.86	1.17
31 40	1 21	4.3		1 20	52.6		1 20	40.8		1 20	29.1		1 20	17.3		1 20	5.6		+0.87	−1.17
31 50	1 21	13.0		1 21	1.3		1 20	49.5		1 20	37.8		1 20	26.0		1 20	14.2		0.88	1.18
32 0	1 21	21.9		1 21	10.1		1 20	58.3		1 20	46.5		1 20	34.8		1 20	23.0		0.88	1.18
32 10	1 21	30.8		1 21	19.0		1 21	7.2		1 20	55.4		1 20	43.6		1 20	31.8		0.89	1.18
32 20	1 21	39.8		1 21	28.0		1 21	16.2		1 21	4.3		1 20	52.5		1 20	40.6		0.90	1.18
32 30	1 21	48.9		1 21	37.0		1 21	25.2		1 21	13.3		1 21	1.5		1 20	49.6		+0.91	−1.19
32 40	1 21	58.0		1 21	46.1		1 21	34.3		1 21	22.4		1 21	10.5		1 20	58.6		0.91	1.19
32 50	1 22	7.2		1 21	55.3		1 21	43.4		1 21	31.5		1 21	19.6		1 21	7.7		0.92	1.19
33 0	1 22	16.5		1 22	4.6		1 21	52.7		1 21	40.7		1 21	28.8		1 21	16.9		0.93	1.19
33 10	1 22	25.9		1 22	13.9		1 22	2.0		1 21	50.0		1 21	38.1		1 21	26.2		0.94	1.20
33 20	1 22	35.3		1 22	23.4		1 22	11.4		1 21	59.4		1 21	47.4		1 21	35.5		+0.95	−1.20
33 30	1 22	44.9		1 22	32.9		1 22	20.9		1 22	8.9		1 21	56.9		1 21	44.9		0.95	1.20
33 40	1 22	54.4		1 22	42.4		1 22	30.4		1 22	18.4		1 22	6.4		1 21	54.4		0.96	1.20
33 50	1 23	4.2		1 22	52.1		1 22	40.1		1 22	28.0		1 22	16.0		1 22	3.9		0.97	1.20
34 0	1 23	13.9		1 23	1.8		1 22	49.8		1 22	37.7		1 22	25.6		1 22	13.6		0.97	1.21
34 10	1 23	23.7		1 23	11.7		1 22	59.6		1 22	47.5		1 22	35.4		1 22	23.3		+0.98	−1.21
34 20	1 23	33.7		1 23	21.6		1 23	9.4		1 22	57.3		1 22	45.2		1 22	33.1		0.99	1.21
34 30	1 23	43.7		1 23	31.5		1 23	19.4		1 23	7.3		1 22	55.1		1 22	43.0		1.00	1.21
34 40	1 23	53.8		1 23	41.6		1 23	29.4		1 23	17.3		1 23	5.1		1 22	53.0		1.01	1.22
34 50	1 24	3.9		1 23	51.7		1 23	39.6		1 23	27.4		1 23	15.2		1 23	3.0		1.02	1.22
35 0	1 24	14.2		1 24	2.0		1 23	49.8		1 23	37.5		1 23	25.3		1 23	13.1		+1.02	−1.22
35 10	1 24	24.5		1 24	12.3		1 24	0.0		1 23	47.8		1 23	35.6		1 23	23.4		1.03	1.22
35 20	1 24	35.0		1 24	22.7		1 24	10.4		1 23	58.2		1 23	45.9		1 23	33.6		1.04	1.23
35 30	1 24	45.5		1 24	33.2		1 24	20.9		1 24	8.6		1 23	56.3		1 23	44.0		1.05	1.23
35 40	1 24	56.0		1 24	43.7		1 24	31.4		1 24	19.1		1 24	6.8		1 23	54.5		1.06	1.23
35 50	1 25	6.7		1 24	54.4		1 24	42.1		1 24	29.7		1 24	17.4		1 24	5.0		+1.07	−1.23
36 0	1 25	17.5		1 25	5.1		1 24	52.8		1 24	40.4		1 24	28.0		1 24	15.7		1.08	1.24
36 10	1 25	28.3		1 25	16.0		1 25	3.6		1 24	51.2		1 24	38.8		1 24	26.4		1.09	1.24
36 20	1 25	39.3		1 25	26.9		1 25	14.5		1 25	2.1		1 24	49.6		1 24	37.2		1.10	1.24
36 30	1 25	50.3		1 25	37.9		1 25	25.5		1 25	13.0		1 25	0.6		1 24	48.2		1.11	1.24
36 40	1 26	1.5		1 25	49.0		1 25	36.6		1 25	24.1		1 25	11.6		1 24	59.2		+1.12	−1.25
36 50	1 26	12.7		1 26	0.2		1 25	47.7		1 25	35.2		1 25	22.7		1 25	10.2		1.13	1.25
37 0	1 26	24.0		1 26	11.5		1 25	59.0		1 25	46.5		1 25	34.0		1 25	21.4		1.13	1.25
37 10	1 26	35.5		1 26	22.9		1 26	10.3		1 25	57.8		1 25	45.2		1 25	32.7		1.14	1.26
37 20	1 26	47.0		1 26	34.4		1 26	21.8		1 26	9.2		1 25	56.6		1 25	44.1		1.15	1.26
37 30	1 26	58.5		1 26	46.0		1 26	33.3		1 26	20.7		1 26	8.1		1 25	55.5		+1.16	−1.26

AZIMUTH OF POLARIS AT ELONGATION, 1915.

Decl. Lat.							Variation for—	
	88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	1' of Lat.	1" of L.
° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	° ' "	"	"
37 30	I 26 58.5	I 26 46.0	I 26 33.3	I 26 20.7	I 26 8.1	I 25 55.5	+1.16	-1.26
37 40	I 27 10.2	I 26 57.6	I 26 45.0	I 26 32.4	I 26 19.7	I 26 7.1	1.17	1.26
37 50	I 27 22.0	I 27 9.4	I 26 56.7	I 26 44.1	I 26 31.4	I 26 18.7	1.18	1.27
38 0	I 27 33.9	I 27 21.3	I 27 8.6	I 26 55.9	I 26 43.2	I 26 30.5	1.19	1.27
38 10	I 27 45.9	I 27 33.2	I 27 20.5	I 27 7.8	I 26 55.1	I 26 42.3	1.20	1.27
38 20	I 27 58.0	I 27 45.3	I 27 32.5	I 27 19.8	I 27 7.0	I 26 54.3	+1.21	-1.27
38 30	I 28 10.2	I 27 57.5	I 27 44.7	I 27 31.9	I 27 19.1	I 27 6.3	1.22	1.28
38 40	I 28 22.5	I 28 9.7	I 27 56.9	I 27 44.1	I 27 31.3	I 27 18.5	1.23	1.28
38 50	I 28 34.9	I 28 22.1	I 28 9.2	I 27 56.4	I 27 43.6	I 27 30.7	1.24	1.28
39 0	I 28 47.4	I 28 34.5	I 28 21.7	I 28 8.8	I 27 55.9	I 27 43.1	1.25	1.29
39 10	I 29 0.0	I 28 47.1	I 28 34.2	I 28 21.3	I 28 8.4	I 27 55.5	+1.26	-1.29
39 20	I 29 12.7	I 28 59.8	I 28 46.9	I 28 33.9	I 28 21.0	I 28 8.1	1.27	1.29
39 30	I 29 25.5	I 29 12.6	I 28 59.6	I 28 46.7	I 28 33.7	I 28 20.7	1.28	1.29
39 40	I 29 38.4	I 29 25.5	I 29 12.5	I 28 59.5	I 28 46.5	I 28 33.5	1.29	1.30
39 50	I 29 51.5	I 29 38.5	I 29 25.4	I 29 12.4	I 28 59.4	I 28 46.4	1.30	1.30
40 0	I 30 4.5	I 29 51.6	I 29 38.5	I 29 25.5	I 29 12.4	I 28 59.4	+1.31	-1.30
40 10	I 30 17.8	I 30 4.8	I 29 51.7	I 29 38.6	I 29 25.5	I 29 12.4	1.32	1.31
40 20	I 30 31.2	I 30 18.1	I 30 5.0	I 29 51.9	I 29 38.8	I 29 25.7	1.33	1.31
40 30	I 30 44.7	I 30 31.6	I 30 18.4	I 30 5.3	I 29 52.1	I 29 39.0	1.34	1.31
40 40	I 30 58.3	I 30 45.1	I 30 31.9	I 30 18.8	I 30 5.6	I 29 52.4	1.35	1.32
40 50	I 31 12.0	I 30 58.8	I 30 45.6	I 30 32.4	I 30 19.1	I 30 5.9	+1.36	-1.32
41 0	I 31 25.8	I 31 12.6	I 30 59.3	I 30 46.1	I 30 32.8	I 30 19.6	1.38	1.32
41 10	I 31 39.7	I 31 26.5	I 31 13.2	I 30 59.9	I 30 46.6	I 30 33.3	1.39	1.33
41 20	I 31 53.8	I 31 40.5	I 31 27.2	I 31 13.9	I 31 0.5	I 30 47.2	1.40	1.33
41 30	I 32 8.0	I 31 54.7	I 31 41.3	I 31 27.9	I 31 14.6	I 31 1.2	1.41	1.33
41 40	I 32 22.2	I 32 8.9	I 31 55.5	I 31 42.1	I 31 28.7	I 31 15.3	+1.42	-1.34
41 50	I 32 36.6	I 32 23.3	I 32 9.8	I 31 56.4	I 31 43.0	I 31 29.6	1.44	1.34
42 0	I 32 51.2	I 32 37.8	I 32 24.3	I 32 10.8	I 31 57.4	I 31 43.9	1.45	1.35
42 10	I 33 5.8	I 32 52.4	I 32 38.9	I 32 25.4	I 32 11.9	I 31 58.4	1.47	1.35
42 20	I 33 20.6	I 33 7.1	I 32 53.6	I 32 40.1	I 32 26.5	I 32 13.0	1.48	1.35
42 30	I 33 35.5	I 33 22.0	I 33 8.4	I 32 54.9	I 32 41.3	I 32 27.7	+1.50	-1.36
42 40	I 33 50.6	I 33 37.0	I 33 23.4	I 33 9.8	I 32 56.2	I 32 42.6	1.51	1.36
42 50	I 34 5.7	I 33 52.1	I 33 38.5	I 33 24.9	I 33 11.2	I 32 57.6	1.52	1.36
43 0	I 34 21.0	I 34 7.4	I 33 53.7	I 33 40.0	I 33 26.4	I 33 12.7	1.53	1.37
43 10	I 34 36.4	I 34 22.8	I 34 9.1	I 33 55.4	I 33 41.6	I 33 27.9	1.55	1.37
43 20	I 34 52.0	I 34 38.3	I 34 24.6	I 34 10.8	I 33 57.0	I 33 43.3	+1.56	-1.37
43 30	I 35 7.7	I 34 54.0	I 34 40.2	I 34 26.4	I 34 12.6	I 33 58.8	1.57	1.37
43 40	I 35 23.5	I 35 9.7	I 34 55.9	I 34 42.1	I 34 28.3	I 34 14.4	1.59	1.37
43 50	I 35 39.5	I 35 25.7	I 35 11.8	I 34 57.9	I 34 44.1	I 34 30.2	1.60	1.39
44 0	I 35 55.5	I 35 41.7	I 35 27.8	I 35 13.9	I 35 0.0	I 34 46.1	1.61	1.39
44 10	I 36 11.8	I 35 57.9	I 35 44.0	I 35 30.0	I 35 16.1	I 35 2.2	+1.63	-1.39
44 20	I 36 28.2	I 36 14.3	I 36 0.3	I 35 46.3	I 35 32.3	I 35 18.4	1.65	1.40
44 30	I 36 44.8	I 36 30.8	I 36 16.7	I 36 2.7	I 35 48.7	I 35 34.7	1.66	1.40
44 40	I 37 1.5	I 36 47.4	I 36 33.3	I 36 19.3	I 36 5.2	I 35 51.2	1.67	1.41
44 50	I 37 18.3	I 37 4.2	I 36 50.1	I 36 36.0	I 36 21.9	I 36 7.8	1.68	1.41
45 0	I 37 35.3	I 37 21.1	I 37 6.9	I 36 52.8	I 36 38.7	I 36 24.5	+1.69	-1.42
45 10	I 37 52.4	I 37 38.2	I 37 24.0	I 37 9.8	I 36 55.6	I 36 41.4	1.71	1.42
45 20	I 38 9.6	I 37 55.4	I 37 41.2	I 37 26.9	I 37 12.7	I 36 58.5	1.72	1.42
45 30	I 38 27.0	I 38 12.8	I 37 58.5	I 37 44.2	I 37 29.9	I 37 15.7	1.74	1.43
45 40	I 38 44.6	I 38 30.3	I 38 16.0	I 38 1.7	I 37 47.3	I 37 33.0	1.75	1.43
45 50	I 39 2.3	I 38 48.0	I 38 33.6	I 38 19.3	I 38 4.9	I 37 50.5	+1.77	-1.43
46 0	I 39 20.2	I 39 5.8	I 38 51.4	I 38 37.0	I 38 22.6	I 38 8.2	1.78	1.44
46 10	I 39 38.2	I 39 23.8	I 39 9.3	I 38 54.9	I 38 40.5	I 38 26.0	1.80	1.44
46 20	I 39 56.4	I 39 41.9	I 39 27.5	I 39 13.0	I 38 58.5	I 38 44.0	1.82	1.45
46 30	I 40 14.8	I 40 0.3	I 39 45.7	I 39 31.2	I 39 16.7	I 39 2.1	1.83	1.45
46 40	I 40 33.3	I 40 18.7	I 40 4.2	I 39 49.6	I 39 35.0	I 39 20.4	+1.85	-1.46
46 50	I 40 52.0	I 40 37.4	I 40 22.8	I 40 8.1	I 39 53.5	I 39 38.9	1.87	1.46
47 0	I 41 10.9	I 40 56.2	I 40 41.5	I 40 26.9	I 40 12.2	I 39 57.5	1.88	1.47
47 10	I 41 29.9	I 41 15.2	I 41 0.5	I 40 45.8	I 40 31.0	I 40 16.3	1.90	1.47
47 20	I 41 49.1	I 41 34.3	I 41 19.6	I 41 4.8	I 40 50.1	I 40 35.3	1.92	1.48
47 30	I 42 8.5	I 41 53.7	I 41 38.8	I 41 24.0	I 41 9.2	I 40 54.4	+1.94	-1.48

AZIMUTH OF POLARIS AT ELONGATION, 1915.

Decl. Lat.							Variation for—	
	88° 51' 0''	88° 51' 10''	88° 51' 20''	88° 51' 30''	88° 51' 40''	88° 51' 50''	r' of Lat.	r'' of δ.
0	0	0	0	0	0	0	''	''
47 30	1 42 8.5	1 41 53.7	1 41 38.8	1 41 24.0	1 41 9.2	1 40 54.4	+1.94	-1.48
47 40	1 42 28.0	1 42 13.2	1 41 58.3	1 41 43.5	1 41 28.6	1 41 13.8	1.96	1.48
47 50	1 42 47.7	1 42 32.8	1 42 17.9	1 42 3.0	1 41 48.1	1 41 33.2	1.98	1.49
48 0	1 43 7.6	1 42 52.7	1 42 37.7	1 42 22.8	1 42 7.8	1 41 52.9	1.99	1.49
48 10	1 43 27.7	1 43 12.7	1 42 57.7	1 42 42.7	1 42 27.7	1 42 12.8	2.01	1.50
48 20	1 43 48.0	1 43 33.0	1 43 17.9	1 43 2.9	1 42 47.8	1 42 32.8	+2.03	-1.50
48 30	1 44 8.5	1 43 53.4	1 43 38.3	1 43 23.2	1 43 8.1	1 42 53.0	2.05	1.51
48 40	1 44 29.2	1 44 14.0	1 43 58.8	1 43 43.7	1 43 28.5	1 43 13.4	2.07	1.52
48 50	1 44 50.0	1 44 34.7	1 44 19.5	1 44 4.3	1 43 49.2	1 43 34.0	2.09	1.52
49 0	1 45 11.0	1 44 55.7	1 44 40.5	1 44 25.2	1 44 10.0	1 43 54.7	2.10	1.53
49 10	1 45 32.2	1 45 16.9	1 45 1.6	1 44 46.3	1 44 31.0	1 44 15.7	+2.12	-1.53
49 20	1 45 53.6	1 45 38.3	1 45 22.9	1 45 7.6	1 44 52.2	1 44 36.9	2.14	1.53
49 30	1 46 15.2	1 45 59.8	1 45 44.4	1 45 29.0	1 45 13.6	1 44 58.2	2.16	1.54
49 40	1 46 37.0	1 46 21.6	1 46 6.1	1 45 50.7	1 45 35.2	1 45 19.8	2.18	1.54
49 50	1 46 59.0	1 46 43.6	1 46 28.1	1 46 12.6	1 45 57.0	1 45 41.5	2.20	1.55
50 0	1 47 21.3	1 47 5.8	1 46 50.2	1 46 34.6	1 46 19.1	1 46 3.5	+2.22	-1.56
50 10	1 47 43.7	1 47 28.1	1 47 12.5	1 46 56.9	1 46 41.3	1 46 25.7	2.24	1.56
50 20	1 48 6.3	1 47 50.7	1 47 35.1	1 47 19.4	1 47 3.7	1 46 48.1	2.26	1.57
50 30	1 48 29.2	1 48 13.5	1 47 57.8	1 47 42.1	1 47 26.4	1 47 10.6	2.29	1.57
50 40	1 48 52.3	1 48 36.6	1 48 20.8	1 48 5.0	1 47 49.2	1 47 33.5	2.31	1.58
50 50	1 49 15.6	1 48 59.8	1 48 44.0	1 48 28.2	1 48 12.3	1 47 56.5	+2.33	-1.58
51 0	1 49 39.1	1 49 23.3	1 49 7.4	1 48 51.5	1 48 35.6	1 48 19.7	2.35	1.59
51 10	1 50 2.9	1 49 47.0	1 49 31.1	1 49 15.1	1 48 59.1	1 48 43.2	2.38	1.59
51 20	1 50 26.9	1 50 10.9	1 49 54.9	1 49 38.9	1 49 22.9	1 49 6.9	2.41	1.60
51 30	1 50 51.1	1 50 35.1	1 50 19.0	1 50 2.9	1 49 46.9	1 49 30.8	2.43	1.61
51 40	1 51 15.6	1 50 59.5	1 50 43.4	1 50 27.2	1 50 11.1	1 49 55.0	+2.46	-1.61
51 50	1 51 40.3	1 51 24.1	1 51 7.9	1 50 51.7	1 50 35.5	1 50 19.4	2.48	1.62
52 0	1 52 5.2	1 51 49.0	1 51 32.7	1 51 16.5	1 51 0.2	1 50 44.0	2.49	1.62
52 10	1 52 30.4	1 52 14.1	1 51 57.8	1 51 41.5	1 51 25.1	1 51 8.8	2.51	1.63
52 20	1 52 55.7	1 52 39.4	1 52 23.1	1 52 6.7	1 51 50.3	1 51 34.0	2.54	1.64
52 30	1 53 21.5	1 53 5.0	1 52 48.6	1 52 32.2	1 52 15.7	1 51 59.3	+2.57	-1.64
52 40	1 53 47.4	1 53 30.9	1 53 14.4	1 52 57.9	1 52 41.4	1 52 24.9	2.59	1.65
52 50	1 54 13.5	1 53 57.0	1 53 40.4	1 53 23.9	1 53 7.3	1 52 50.8	2.62	1.66
53 0	1 54 40.0	1 54 23.4	1 54 6.8	1 53 50.1	1 53 33.5	1 53 16.9	2.64	1.66
53 10	1 55 6.7	1 54 50.0	1 54 33.3	1 54 16.6	1 54 0.0	1 53 43.3	2.67	1.67
53 20	1 55 33.6	1 55 16.9	1 55 0.2	1 54 43.4	1 54 26.7	1 54 9.9	+2.70	-1.68
53 30	1 56 0.9	1 55 44.1	1 55 27.3	1 55 10.5	1 54 53.6	1 54 36.8	2.73	1.68
53 40	1 56 28.4	1 56 11.5	1 55 54.7	1 55 37.8	1 55 20.9	1 55 4.0	2.75	1.69
53 50	1 56 56.2	1 56 39.3	1 56 22.3	1 56 5.4	1 55 48.4	1 55 31.5	2.78	1.69
54 0	1 57 24.3	1 57 7.3	1 56 50.2	1 56 33.2	1 56 16.2	1 55 59.2	2.80	1.70
54 10	1 57 52.6	1 57 35.5	1 57 18.5	1 57 1.4	1 56 44.3	1 56 27.2	+2.83	-1.71
54 20	1 58 21.2	1 58 4.1	1 57 47.0	1 57 29.8	1 57 12.7	1 56 55.5	2.87	1.72
54 30	1 58 50.2	1 58 33.0	1 58 15.8	1 57 58.6	1 57 41.3	1 57 24.1	2.90	1.72
54 40	1 59 19.5	1 59 2.2	1 58 44.9	1 58 27.6	1 58 10.3	1 57 53.0	2.93	1.73
54 50	1 59 49.0	1 59 31.6	1 59 14.3	1 58 56.9	1 58 39.5	1 58 22.2	2.96	1.74
55 0	2 0 18.9	2 0 1.4	1 59 44.0	1 59 26.5	1 59 9.1	1 58 51.6	+2.98	-1.75
55 10	2 0 49.0	2 0 31.5	2 0 14.0	1 59 56.5	1 59 39.0	1 59 21.4	3.01	1.75
55 20	2 1 19.5	2 1 1.9	2 0 44.3	2 0 26.7	2 0 9.1	1 59 51.6	3.04	1.76
55 30	2 1 50.3	2 1 32.6	2 1 15.0	2 0 57.3	2 0 39.6	2 0 22.0	3.07	1.77
55 40	2 2 21.5	2 2 3.7	2 1 45.9	2 1 28.2	2 1 10.4	2 0 52.7	3.10	1.77
55 50	2 2 52.8	2 2 35.0	2 2 17.2	2 1 59.4	2 1 41.6	2 1 23.8	+3.13	-1.78
56 0	2 3 24.6	2 3 6.7	2 2 48.8	2 2 30.9	2 2 13.1	2 1 55.2	3.17	1.79
56 10	2 3 56.7	2 3 38.8	2 3 20.8	2 3 2.8	2 2 44.9	2 2 26.9	3.21	1.80
56 20	2 4 29.2	2 4 11.2	2 3 53.1	2 3 35.1	2 3 17.0	2 2 59.0	3.24	1.80
56 30	2 5 2.0	2 4 43.9	2 4 25.8	2 4 7.6	2 3 49.5	2 3 31.4	3.28	1.81
56 40	2 5 35.2	2 5 17.0	2 4 58.8	2 4 40.6	2 4 22.3	2 4 4.1	+3.31	-1.82
56 50	2 6 8.7	2 5 50.4	2 5 32.1	2 5 13.8	2 4 55.5	2 4 37.2	3.34	1.83
57 0	2 6 42.6	2 6 24.2	2 6 5.8	2 5 47.5	2 5 29.1	2 5 10.7	3.37	1.84
57 10	2 7 16.8	2 6 58.4	2 6 39.9	2 6 21.5	2 6 3.0	2 5 44.6	3.42	1.84
57 20	2 7 51.5	2 7 32.9	2 7 14.4	2 6 55.9	2 6 37.3	2 6 18.8	3.46	1.85
57 30	2 8 26.4	2 8 7.8	2 7 49.2	2 7 30.6	2 7 12.0	2 6 53.4	+3.50	-1.86



AZIMUTH OF POLARIS AT ELONGATION, 1915.

Decl. Lat.	88° 51' 0''		88° 51' 10''		88° 51' 20''		88° 51' 30''		88° 51' 40''		88° 51' 50''		Variation for—	
													r' of Lat.	r'' of l.
• /	0	/	0	/	0	/	0	/	0	/	0	/	''	''
57 30	2	8 26.4	2	8 7.8	2	7 49.2	2	7 30.6	2	7 12.0	2	6 53.4	+3.50	-1.86
57 40	2	9 1.9	2	8 43.2	2	8 24.5	2	8 5.8	2	7 47.0	2	7 28.3	3.54	1.87
57 50	2	9 37.7	2	9 18.9	2	9 0.1	2	8 41.3	2	8 22.5	2	8 3.7	3.57	1.88
58 0	2	10 13.8	2	9 55.0	2	9 36.1	2	9 17.2	2	8 58.3	2	8 39.4	3.61	1.89
58 10	2	10 50.4	2	10 31.5	2	10 12.5	2	9 53.5	2	9 34.6	2	9 15.8	3.66	1.90
58 20	2	11 27.4	2	11 8.4	2	10 49.3	2	10 30.3	2	10 11.2	2	9 52.2	+3.70	-1.91
58 30	2	12 4.8	2	11 45.7	2	11 26.6	2	11 7.4	2	10 48.3	2	10 29.1	3.74	1.92
58 40	2	12 42.7	2	12 23.5	2	12 4.3	2	11 45.0	2	11 25.8	2	11 6.5	3.78	1.92
58 50	2	13 21.0	2	13 1.7	2	12 42.3	2	12 23.0	2	12 3.7	2	11 44.4	3.82	1.93
59 0	2	13 59.7	2	13 40.3	2	13 20.9	2	13 1.5	2	12 42.0	2	12 22.6	3.87	1.94
59 10	2	14 38.9	2	14 19.4	2	13 59.9	2	13 40.3	2	13 20.8	2	13 1.3	+3.92	-1.95
59 20	2	15 18.5	2	14 58.9	2	14 39.3	2	14 19.7	2	14 0.0	2	13 40.4	3.96	1.96
59 30	2	15 58.6	2	15 38.9	2	15 19.2	2	14 59.5	2	14 39.7	2	14 20.0	4.00	1.97
59 40	2	16 39.1	2	16 19.3	2	15 59.5	2	15 39.7	2	15 19.9	2	15 0.1	4.05	1.98
59 50	2	17 20.2	2	17 0.2	2	16 40.3	2	16 20.4	2	16 0.5	2	15 40.6	4.10	1.99
60 0	2	18 1.7	2	17 41.7	2	17 21.6	2	17 1.6	2	16 41.6	2	16 21.6	+4.15	-2.00

TABLE Va.

FOR REDUCING TO ELONGATION, OBSERVATIONS MADE NEAR ELONGATION.

Azimuth at Elong.	1° 10'		1° 20'		1° 30'		1° 40'		1° 50'		2° 0'		2° 10'		2° 20'		Azimuth at Elong.	
*Time.																	Time *	
m	''		''		''		''		''		''		''		''		m	
0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0	
1	+ 0.1		+ 0.1		+ 0.1		+ 0.1		+ 0.1		+ 0.1		+ 0.1		+ 0.2		1	
2	0.2		0.2		0.2		0.2		0.3		0.3		0.3		0.3		2	
3	0.4		0.4		0.4		0.5		0.6		0.6		0.7		0.7		3	
4	0.6		0.7		0.8		0.9		1.0		1.1		1.2		1.3		4	
5	+ 1.0		+ 1.1		+ 1.3		+ 1.4		+ 1.6		+ 1.7		+ 1.9		+ 2.0		5	
6	1.4		1.6		1.8		2.1		2.3		2.5		2.7		2.9		6	
7	2.0		2.2		2.5		2.8		3.1		3.4		3.7		3.9		7	
8	2.6		2.9		3.3		3.7		4.0		4.4		4.8		5.1		8	
9	3.3		3.7		4.2		4.7		5.1		5.5		6.0		6.5		9	
10	+ 4.0		+ 4.6		+ 5.1		+ 5.7		+ 6.3		+ 6.8		+ 7.4		+ 8.0		10	
11	4.9		5.6		6.2		6.9		7.6		8.3		9.0		9.7		11	
12	5.8		6.6		7.4		8.2		9.0		9.9		10.7		11.5		12	
13	6.8		7.8		8.7		9.7		10.6		11.6		12.5		13.5		13	
14	7.8		9.0		10.1		11.2		12.3		13.4		14.5		15.7		14	
15	+ 9.0		+ 10.3		+ 11.6		+ 12.9		+ 14.1		+ 15.4		+ 16.7		+ 18.0		15	
16	10.2		11.7		13.2		14.6		16.1		17.5		19.0		20.4		16	
17	11.5		13.2		14.9		16.4		18.2		19.8		21.4		23.0		17	
18	12.9		14.8		16.7		18.5		20.4		22.2		24.0		25.9		18	
19	14.4		16.5		18.6		20.7		22.7		24.7		26.8		28.9		19	
20	+ 16.0		+ 18.3		+ 20.6		+ 22.9		+ 25.1		+ 27.4		+ 29.7		+ 32.0		20	
21	17.7		20.2		22.7		25.2		27.7		30.2		32.7		35.3		21	
22	19.4		22.1		24.9		27.6		30.4		33.2		35.9		38.7		22	
23	21.2		24.2		27.2		30.2		33.2		36.3		39.2		42.3		23	
24	23.0		26.3		29.6		32.9		36.2		39.4		42.7		46.0		24	
25	+ 25.0		+ 28.6		+ 32.1		+ 35.7		+ 39.3		+ 42.7		+ 46.3		+ 49.9		25	
26	27.0		30.9		34.7		38.6		42.4		46.3		50.1		54.0		26	
27	29.1		33.3		37.5		41.6		45.7		50.0		54.0		58.2		27	
28	31.3		35.8		40.3		44.7		49.2		53.7		58.1		62.6		28	
29	33.6		38.4		43.2		48.0		52.8		57.6		62.3		67.1		29	
30	+ 35.9		+ 41.1		+ 46.2		+ 51.4		+ 56.5		+ 61.6		+ 66.7		+ 71.8		30	

\*Sidereal time from elongation.

FOR FINDING THE TIMES OF UPPER AND LOWER CULMINATION OF POLARIS FROM THE OBSERVED TIMES WHEN THE STAR IS ON THE SAME VERTICAL CIRCLE WITH THE STARS ζ URSÆ MAJORIS (MIZAR) *SUB POLO* AND δ CASSIOPEIÆ *SUB POLO*, RESPECTIVELY.

Except at high latitudes, the pole star at either upper or lower culmination furnishes a simple and convenient method for laying down a meridian line on the earth's surface at points in the northern hemisphere. When the local time is unknown and accurate astronomical instruments are not available, the time of culmination of Polaris may be found by observing the instant when Polaris is vertically above (has the same azimuth as) ζ Ursæ Majoris (Mizar) below the pole, or δ Cassiopeiæ below the pole. In the former case, for the year 1915, Polaris is approaching upper culmination and in the latter case it is approaching lower culmination. The mean time interval which elapses between the observed times above mentioned and upper or lower culmination, as the case may be, are given for ζ Ursæ Majoris and δ Cassiopeiæ for ten-day intervals in the following table. This method can not be used at places south of 30° north latitude.

TABLE VI.

MEAN TIME INTERVAL.

ζ URSÆ MAJORIS (MIZAR). (Upper culmination of Polaris.)						δ CASSIOPEIÆ. (Lower culmination of Polaris.)							
1915	Lat.	40°	45°	50°	55°	60°	1915	Lat.	35°	40°	45°	50°	55°
		m s	m s	m s	m s	m s			m s	m s	m s	m s	m s
Jan.	1	8 18	8 16	8 14	8 12	8 9	Jan.	1	9 23	9 24	9 26	9 29	9 31
	11	8 8	8 6	8 4	8 2	7 59		11	9 13	9 14	9 16	9 18	9 20
	21	7 56	7 55	7 53	7 51	7 48		21	9 1	9 3	9 5	9 7	9 9
July	10	8 13	8 12	8 10	8 7	8 4	Feb.	31	8 51	8 52	8 54	8 56	8 58
	20	8 24	8 23	8 21	8 18	8 15		10	8 41	8 43	8 44	8 46	8 49
	30	8 35	8 33	8 31	8 28	8 25		20	8 32	8 33	8 35	8 37	8 39
Aug.	9	8 45	8 44	8 42	8 39	8 36	Mar.	2	8 23	8 25	8 26	8 28	8 31
	19	8 55	8 53	8 51	8 49	8 46		12	8 18	8 19	8 20	8 22	8 25
	29	9 4	9 2	9 0	8 57	8 54		22	8 13	8 15	8 16	8 18	8 20
Sept.	8	9 11	9 9	9 7	9 4	9 1	Apr.	1	8 10	8 12	8 13	8 15	8 17
	18	9 19	9 17	9 15	9 12	9 8		11	8 10	8 11	8 13	8 15	8 17
	28	9 23	9 21	9 19	9 16	9 13		21	8 13	8 14	8 16	8 18	8 20
Oct.	8	9 26	9 24	9 22	9 19	9 16	May	1	8 16	8 17	8 19	8 21	8 23
	18	9 28	9 26	9 24	9 21	9 18		11	8 21	8 22	8 24	8 26	8 28
	28	9 29	9 27	9 25	9 22	9 19		21	8 28	8 29	8 31	8 33	8 35
Nov.	7	9 28	9 26	9 24	9 21	9 17	June	31	8 37	8 38	8 40	8 42	8 44
	17	9 24	9 22	9 20	9 17	9 14		10	8 46	8 47	8 49	8 51	8 54
	27	9 19	9 17	9 15	9 12	9 9		20	8 56	8 57	8 59	9 1	9 4
Dec.	7	9 13	9 11	9 9	9 6	9 3	July	30	9 7	9 9	9 11	9 13	9 15
	17	9 5	9 3	9 1	8 58	8 55		10	9 19	9 20	9 22	9 24	9 27
	27	8 56	8 54	8 52	8 49	8 46		20	9 30	9 31	9 33	9 35	9 38
	31	8 53	8 51	8 49	8 46	8 43		30	9 40	9 42	9 44	9 47	9 49



# ON THE ARRANGEMENT AND USE OF THE AMERICAN EPHEMERIS AND NAUTICAL ALMANAC.

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The matter contained in the first 175 pages of this volume is intended primarily for the use of navigators, and consists of ephemerides of the Sun and Moon and of the planets Mercury, Venus, Mars, Jupiter, and Saturn. The remainder of the book contains ephemerides of all the planets, of their satellites, of 825 fixed stars, elements for the computation of predictions of eclipses of the Sun and Moon and of occultations of stars, tables of the pole star, Polaris, and in addition miscellaneous data for the convenience and use of astronomers, surveyors, and the general public.

## TIME.

There are in general use three different kinds of time, True Solar Time—also called Apparent Solar Time—Mean Solar Time, and Sidereal Time.

*True or Apparent Solar Time* is measured by the diurnal motion of the Sun, the length of the day being the interval between two successive transits of the Sun over the same meridian, and the time of day being the hour-angle of the Sun westward from the meridian. Owing to the obliquity of the ecliptic and to the lack of uniformity of the motion of the Earth in its orbit, the rate of motion of the Sun in hour-angle and the length of the apparent solar day are not constant. Therefore clocks and chronometers can not be regulated to apparent solar time, which may, however, be determined by observations of the Sun when visible.

*Mean Solar Time* is measured by the motion of a fictitious body called the mean Sun which is supposed to move uniformly in the celestial equator, completing the circuit in one tropical year. Since mean solar time is uniform and regular in its passage, clocks and watches may be regulated to it, and those in ordinary use are usually so regulated.

Mean solar time can not, of course, be determined by direct observation, but may be determined indirectly by correcting observations of the Sun for the equation of time (page 702), or by converting to mean time sidereal time determined by observations of fixed stars (page 701).

*The Mean Solar Day* is the unit of mean solar time, and is equal in length to the mean or average of all the true or apparent solar days of the year. It may be otherwise defined as the interval of time elapsing between two successive transits of the mean Sun across the meridian of any place.

*Sidereal Time* or star time, in general terms, is measured by the diurnal motion of the fixed stars, or, speaking more precisely, by the diurnal motion of that point on the celestial equator called the vernal equinox, from which the right ascensions of the heavenly bodies are measured. Astronomical clocks regulated to sidereal time are called sidereal clocks. Sidereal time may be determined from observations of stars whose right ascensions are known.

A *Sidereal Day* is very nearly the length of time in which the Earth rotates on its axis and is accurately defined as the time interval between two successive transits of the vernal equinox over the same meridian. The sidereal day is shorter than the mean solar day by  $3^m\ 56^s.555$  sidereal time or  $3^m\ 55^s.909$  mean solar time, the tropical year of 365.2422 mean solar days containing 366.2422 sidereal days. Sidereal time and the length of the sidereal day are subject to slight irregularities on account of small differences between the positions of the true and mean equinoxes.

The mean solar and sidereal days are each divided into 24 hours. About March 23 (civil date) of each year, about two days after the vernal equinox, there is an instant when the face of a sidereal clock shows the same time as a mean time clock, and the former gains on the latter  $3^m\ 56^s.555$  sidereal time per mean solar day, so that at the end of a year it will have gained one sidereal day and will again agree with the mean time clock.

*The Equation of Time* is the difference in hour-angle between the true Sun and the mean Sun. The true Sun is sometimes before and sometimes behind the mean Sun by an amount which varies from zero to about 16 minutes. The equation of time is given on pages I and II of each month of the Greenwich Ephemeris, and in the Solar Ephemeris for the Meridian of Washington, pages 518-525.

*The Civil Day* begins at midnight and comprises 24 hours, the hours being counted from 0 to 12 in two series; the first, marked A. M., running from midnight to noon, and the second, marked P. M., running from noon to midnight.

*The Astronomical Day* begins at noon on the civil day of the same date, the 24 hours being counted from 0 to 24, running from noon of one day to noon of the next following day. Astronomical time as well as civil time may be either apparent or mean.

The civil day begins twelve hours before the astronomical day; therefore the first half of the civil day corresponds to the last half of the preceding astronomical day, and the last half of the civil day coincides with the first half of the astronomical day of the same date. Thus, January 9, 2 o'clock, A. M., civil time, is January 8,  $14^h$ , astronomical time; and January 9, 2 o'clock, P. M., civil time, is January 9,  $2^h$ , astronomical time.

#### PRECEPTS FOR THE CONVERSION OF TIME.

*To convert Sidereal Time at any place into Mean Solar Time*, subtract the sidereal time of local mean noon for the beginning of the astronomical day, from the given sidereal time, and convert the interval of sidereal time thus found into mean time by means of Table II, page 686.

*To convert Mean Solar Time at any place into Sidereal Time*, convert the given interval of mean time (counted from mean noon) into sidereal time by means of Table III, page 689, and add the sidereal time of local mean noon for the beginning of the astronomical day.

Processes similar to the above may be employed, using the mean time of sidereal noon given on page III of the Greenwich Ephemeris instead of the sidereal time of mean noon.

*To convert Apparent Solar Time into Mean Solar Time*, add or subtract the equation of time as indicated on page I of the Greenwich Ephemeris, or add algebraically the equation of time taken from the Washington Solar Ephemeris, pages 518–525.

*To convert Mean Solar Time into Apparent Solar Time*, add or subtract the equation of time as indicated on page II of the Greenwich Ephemeris, or subtract algebraically the equation of time taken from the Washington Solar Ephemeris, pages 518–525.

*To convert Civil Time into Astronomical Time*.—If the civil time is marked A. M., take one from the day and add twelve to the hours; if the civil time is marked P. M., take away the designation P. M.

*To convert Astronomical Time into Civil Time*.—If the astronomical time is less than twelve hours, write P. M. after it; if greater than twelve hours, subtract twelve hours from it, mark the result A. M., and add one to the days. For example, October 3, 23 hours, astronomical time, is October 4, 11 o'clock, A. M., civil time.

*To convert Mean Solar or Sidereal Time of any meridian B to that of another meridian A*, add the difference of longitude expressed in time when A is east of B, and subtract the difference of longitude when A is west of B.

#### PART I.—THE EPHEMERIS FOR THE MERIDIAN OF GREENWICH.

Pages 2–145 give data arranged under the heads of the several months, and are therefore designated as the Calendar. Each month covers 12 pages, numbered from I to XII, whose contents are as follows:

Page I contains, for Greenwich apparent noon of each day, *The Sun's Apparent Right Ascension* and *Declination*, and the *Equation of Time*. Adjoining columns contain the differences of these quantities for one hour. By multiplying any one of these differences by the hours and parts of an hour from Greenwich apparent noon, and adding the product to, or subtracting it from, the corresponding quantity at noon, according as that quantity is increasing or decreasing, we obtain the value of the quantity in question for any given Greenwich apparent time. The hourly differences are given for the instant of apparent noon at Greenwich, but when great accuracy is required they should be interpolated for half the hours and parts of an hour of the Greenwich apparent time.

The *Equation of Time* given on page I is the mean time of apparent noon, or the hour-angle of the mean Sun at that instant. The heading of the column directs how the equation is to be applied to apparent time, or the time given by an observation of the Sun, in order to get mean time. When in the course of the month there is a change from addition to subtraction or the reverse (as in the months of April and June), the two different directions are separated by a line, while a corresponding line below points out the dates between which the change occurs.

*The Sun's Semidiameter* and the *Sidereal Time of Semidiameter Passing Meridian* are also given on page I. The semidiameter is used in reducing the altitude of the upper or lower limb of the Sun to the altitude of the center; and in reducing the angular distance between the limb of the Sun and any other object, to the distance from the center of the Sun. The sidereal time of semidiameter passing the meridian is employed in obtaining the passage of the Sun's center over the wires of a transit

instrument, when the passage of one limb only has been observed. The quantity found in this column is to be added to the time of transit of the first, or western, limb; and to be subtracted from the time of transit of the second, or eastern, limb.

This page is chiefly used when the Sun is observed on the meridian, at which instant the local apparent time is  $0^h\ 0^m\ 0^s$ . The longitude from Greenwich expressed in time is then the corresponding Greenwich apparent time before or after noon according as the longitude is east or west. The longitude of any place is therefore the factor employed in reducing the quantities on this page to apparent noon at that place.

The right ascension of the Sun thus reduced is the sidereal time of local apparent noon, and the difference between that and the clock time of the meridian passage of the Sun is the error of the clock on sidereal time.

The declination of the Sun reduced to the meridian, or apparent noon, of the place, is required in finding the latitude from a meridian altitude of the Sun.

As an example of the use of page I:—  
Let the Sun's declination be required at apparent noon, 1915, April 15, at a place whose longitude is  $89^\circ\ 40'$ , or  $5^h\ 58^m\ 40^s$  west from Greenwich:—

Local apparent time	April 15,	$0^h\ 0^m\ 0^s$
Longitude from Greenwich (additive)		$5\ 58\ 40$
Greenwich apparent time	April 15,	$5\ 58\ 40$

Reducing the minutes and seconds to decimals of an hour, we find that this moment is  $5^h.978$  after Greenwich apparent noon on April 15, or  $18^h.022$  before Greenwich apparent noon on April 16.

On page 38 of the Ephemeris we find that the change of declination in one hour is:

April 15, at Greenwich apparent noon	$+53.94$
April 16, at Greenwich apparent noon	$+53.54$
Difference for one day	$-0.40$

If great exactness is desired, we find the amount of this hourly difference for the time which is halfway between Greenwich noon and the time of observation; that is, for 3 hours after Greenwich noon of the 15th, this being half of 6 hours. Three hours is 0.125 of a day; so the calculation is as follows:

Difference for one hour, April 15	$+53.94$
Change for 0.125 of a day or $-0''.40 \times 0.125$	$-0.05$
Difference at 3 hours after noon	$+53.89$
$53.89 \times 5.978 = 322''.2 = 5'\ 22''.2$	
Declination at Greenwich noon, April 15	N. $9\ 28\ 42.7$
Change in 5.978 hours (additive)	$5\ 22.2$
Sun's declination at time of observation	N. $9\ 34\ 4.9$

When the time of observation is only a few hours before Greenwich noon, it may be better to count the longitude backward from this nearest noon. Thus, in the example just given the time is  $18^h.022$  before Greenwich noon of April 16; half this interval is about 0.375 of a day, and the hourly motion for the middle of the



interval is  $53''.69$ . Then, we find—

Declination at Greenwich noon, April 16 . . .	N.	9	50	12.4
Product of $53''.69 \times 18.022 = 967''.6$ (subtractive)		—	16	7.6
<hr/>				
Sun's declination at time of observation . . .	N.	9	34	4.8

It will always be well to make the calculation in both ways, as a check; but if the results differ slightly, the one derived from the nearest noon should be regarded as the more accurate.

Page II contains, for Greenwich mean noon of each day, *The Sun's Apparent Right Ascension* and *Declination*, the *Equation of Time*, and the *Sidereal Time of Mean Noon*. The hourly changes of these quantities are also given, and may be used in reducing them for the longitude, or to any Greenwich mean time. When great precision is required, these changes should be interpolated for half the Greenwich time, as described in explaining the calculation of the declination.

The *Equation of Time* given on page II is the apparent time of mean noon, and is equivalent to the hour-angle of the true Sun at the instant of mean noon. The heading of the column directs how the equation must be applied to mean time in order to obtain apparent time.

The *Sidereal Time of Mean Noon* is the right ascension of the mean Sun at Greenwich mean noon. It may be reduced for the longitude, or to any Greenwich mean time, by using the hourly difference,  $9^s.8565$ ; or by Table III, page 689 of this volume, for reducing intervals of mean solar to sidereal time.

The right ascensions and declinations on pages I and II are affected both by aberration and nutation, and therefore denote the *apparent* positions of the *true* Sun. Page I is used for observations which depend upon apparent time, as when the Sun is observed on the meridian; while page II is used when the times have been noted by a clock or chronometer regulated to mean time, as is the case in most observations of the Sun out of the meridian.

The Sun's declination is required whenever that body is observed for the purpose of finding latitude, local time, or azimuth, and the equation of time is needed in finding the apparent time when determining the latitude from observations of the Sun out of the meridian.

The sidereal time of mean noon, or right ascension of the mean Sun, is useful in converting mean time to sidereal time. We first find the Greenwich mean time, then the right ascension of the mean Sun for that time, and this being added to the local astronomical mean time will give the sidereal time.

The sidereal time of mean noon, reduced for the longitude of the place, is also used in converting sidereal time to mean time. Subtracting the reduced value from the given sidereal time gives the interval of sidereal time from noon, and that is converted into the required mean time by subtracting from it the corresponding reduction of a sidereal interval to a mean-time interval, taken from Table II, page 686 of this volume. Instead of using Table II, this reduction may be found by multiplying  $9^s.8296$  by the hours and parts of an hour of the sidereal interval from noon.

As examples of the use of page II:—

33281°—1915—45

[Eph 15]



1.—Let the Sun's right ascension and the equation of time be required for 1915, July 13, 10<sup>h</sup> 3<sup>m</sup> 30<sup>s</sup>, A. M., mean time, at a place whose longitude is 85° 15', or 5<sup>h</sup> 41<sup>m</sup> 0<sup>s</sup> west of Greenwich.

Local astronomical mean time . . . . .	July 12,	<div><div>h</div><div>m</div><div>s</div><div>22</div><div>3</div><div>30</div></div>
Longitude from Greenwich (additive) . . . . .		<div><div>5</div><div>41</div><div>0</div></div>
Greenwich mean time . . . . .	July 13,	<div><div>3</div><div>44</div><div>30</div></div> =3 <sup>h</sup> .7417

Sun's Right Ascension.

Equation of Time.

July 13, Greenwich noon	<div><div>h</div><div>m</div><div>s</div><div>7</div><div>26</div><div>34.28</div></div>	July 13, Greenwich noon	<div><div>m</div><div>s</div><div>5</div><div>25.71</div></div> (subtractive)
H. D. 10 <sup>s</sup> .173×3.7417	<div><div>+</div><div>38.06</div></div>	H. D. +0 <sup>s</sup> .316×3.7417	<div><div>+</div><div>1.18</div></div>
	<div><div>7</div><div>27</div><div>12.34</div></div>		<div><div>5</div><div>26.89</div></div>

In this case the hourly differences interpolated to half the interval, or 1<sup>h</sup>.87 after noon, have been used. The equation of time is here subtractive from mean time.

2.—If the sidereal time is required for the same time and place, we have—

July 13, sidereal time (at Greenwich mean noon) . . . . .	<div><div>h</div><div>m</div><div>s</div><div>7</div><div>21</div><div>8.57</div></div>
Reduction for 3 <sup>h</sup> 44 <sup>m</sup> 30 <sup>s</sup> from Table III, or 9 <sup>s</sup> .8565×3.7417 . . . . .	<div><div>+</div><div>36.88</div></div>
Add the local astronomical mean time . . . . .	<div><div>22</div><div>3</div><div>30.00</div></div>
The required sidereal time is (rejecting 24 <sup>h</sup> ) . . . . .	<div><div>5</div><div>25</div><div>15.45</div></div>

3.—On 1915, July 13, A. M., at a place whose longitude is 85° 15' W., suppose the sidereal time to be 5<sup>h</sup> 26<sup>m</sup> 12<sup>s</sup>.44 and that the corresponding mean time is required.

The astronomical day is July 12; the longitude in time, +5<sup>h</sup> 41<sup>m</sup> 0<sup>s</sup>, or +5<sup>h</sup>.6833

July 12, sidereal time (at Greenwich mean noon) . . . . .	<div><div>h</div><div>m</div><div>s</div><div>7</div><div>17</div><div>12.01</div></div>
Reduction for 5 <sup>h</sup> 41 <sup>m</sup> 0 <sup>s</sup> from Table III, or 9 <sup>s</sup> .8565×5.6833 . . . . .	<div><div>+</div><div>56.02</div></div>
The sidereal time of local mean noon . . . . .	<div><div>7</div><div>18</div><div>8.03</div></div>
The given sidereal time (+24 <sup>h</sup> , if necessary for the following subtraction) . . . . .	<div><div>29</div><div>26</div><div>12.44</div></div>
Subtracting the first from the second gives the sidereal interval from noon . . . . .	<div><div>22</div><div>8</div><div>4.41</div></div> =22 <sup>h</sup> .1346
Reduction for 22 <sup>h</sup> 8 <sup>m</sup> 4 <sup>s</sup> .41 from Table II, or −9 <sup>s</sup> .8296×22.1346 . . . . .	<div><div>−</div><div>3</div><div>37.57</div></div>
The required astronomical mean time is . . . . .	July 12, <div><div>22</div><div>4</div><div>26.84</div></div>

Page III contains, for Greenwich mean noon of each day, *The Sun's True Longitude* and *Latitude*, and the *Logarithm of the Radius Vector of the Earth*. The longitudes of the Sun are the true geometric longitudes, not corrected for aberration. They are given in two columns, headed, respectively, λ and λ'; λ representing the Sun's longitude counted from the true equinox of the date; and λ', the same coordinate counted from the mean equinox of the beginning of the Besselian fictitious year. The latitude is referred to the mean ecliptic of the date. Columns of hourly differences are given to facilitate finding the Sun's longitude, or the logarithm of the radius vector, for any hour from noon.

The last column on page III contains the *Mean Time of Sidereal Noon*; that is, the number of hours, minutes, and seconds after Greenwich mean noon when the vernal equinox passes the meridian of Greenwich. It may be reduced to any

meridian, or to any Greenwich sidereal time, by using the hourly difference,  $-9^s.8296$ , to effect the necessary interpolation. The reduction, however, can be taken directly from Table II for reducing intervals of sidereal time to mean solar time.

This column may be used in converting sidereal time to mean time instead of that on page II. As an illustration, let us take Example 3, above.

It is seen in advance that the sum of the mean time of sidereal noon and the given sidereal time is less than 24 hours. Were it more than 24 hours, the mean time of sidereal noon should be taken out for July 11; that is, the preceding astronomical day.

July 12, the mean time of Greenwich sidereal noon is . . . . .	h	m	s
	16	40	3.70
Reduction for longitude from Table II, or $-9^s.8296 \times 5.683$ . . . . .			-55.86
<hr/>			
The mean time of local sidereal noon . . . . .	16	39	7.84
Add the given sidereal time . . . . .	5	26	12.44 = $5^h.4368$
<hr/>			
The sum is . . . . .	22	5	20.28
Reduction for $5^h 26^m 12^s.44$ from Table II, or $-9^s.8296 = 5.4368$ . . . . .			-53.44
<hr/>			
The required astronomical mean time . . . . . July 12,	22	4	26.84

Page IV contains *The Moon's Semidiameter and Equatorial Horizontal Parallax* for each mean noon and midnight at Greenwich. Columns adjoining those of the horizontal parallax give the change of that quantity in one hour, by means of which it can be reduced to any other Greenwich mean time, in the same way as the Sun's declination and the equation of time in the preceding examples. The sign plus or minus is prefixed to the hourly differences, according as the horizontal parallax is increasing or decreasing.

The reduction of the Moon's semidiameter may be readily found by multiplying the reduction of the horizontal parallax by 0.2725 (see p. xi), or by simply computing the proportional part.

If, for example, the semidiameter of the Moon is to be taken out for 1915, March 10,  $7^h$ , P. M., Greenwich mean time, we see that the difference of the semidiameters at noon and midnight of March 10 is  $3''.7$ ; then,

$$12^h : 7^h = 3''.7 : 2''.2$$

which is the correction to be subtracted from the semidiameter at noon, because the semidiameter is decreasing. The Moon's semidiameter for March 10,  $7^h$ , is therefore  $15' 51''.1$ .

The Moon's semidiameter and horizontal parallax are required for all observations of the Moon. When great precision is needed, the hourly differences should be interpolated for half the interval of Greenwich time from noon or midnight, and the horizontal parallax should be corrected for the latitude of the place of observation.

The mean time of *The Moon's Upper Transit* at Greenwich and the *Age of the Moon* are also contained on page IV. The time of transit is given to tenths of a minute, and is accompanied by a column of differences for one hour of longitude, by means of which the local time of the Moon's meridian transit may be computed for any other place whose longitude is known. The age of the Moon, or the time elapsed since the preceding new Moon, is given to tenths of a day.

Pages V–XII contain *The Moon's Right Ascension and Declination* for each day and hour of Greenwich mean time. They are accompanied by columns of differences for one minute, which are also given at each hour. The Greenwich mean time, which is required for taking out these quantities, may either be taken from a well-regulated chronometer, or may be obtained by applying the longitude, converted into time, to the local mean time of the observer. The right ascension or declination is taken out for the given day and hour of Greenwich mean time; the *Diff. for 1 Minute* is multiplied by the minutes and parts of a minute of the Greenwich time, and the product is added to or subtracted from the quantity, according as the latter is increasing or decreasing.

Thus, suppose the Moon's right ascension and declination are required for 1915, January 25, 10<sup>h</sup> 10<sup>m</sup> 30<sup>s</sup>, astronomical mean time at Greenwich:—

Right Ascension.				Declination.			
	h	m	s		°	'	"
January 25, 10 <sup>h</sup>	4	4	3.80	N.	26	4	33.1
Diff. 2 <sup>d</sup> .1777 × 10.5			22.87				+ 57.0
<hr/>				<hr/>			
January 25, 10 <sup>h</sup> 10 <sup>m</sup> 30 <sup>s</sup>	4	4	26.67	N.	26	5	30.1

For the sake of precision, the differences here employed have been interpolated for 5<sup>m</sup>.2=0<sup>d</sup>.09.

Page XII contains also the *Phases of the Moon* and the dates of the *Moon's Perigee and Apogee*, or least and greatest distances from the Earth.

Pages 146–177 contain the geocentric ephemerides of the seven major planets. The places given are apparent positions; that is, they are referred to the equator and true equinox of the date, and are corrected for aberration. All the data except meridian passage are given for the instant of Greenwich mean noon. The column *Meridian Passage* shows the hour, minute, and tenth of that passage of the planet over the meridian of Greenwich which occurs next after the noon of the date.

The right ascension and declination of a planet are required whenever it is observed for time, latitude, or azimuth. The mode of reducing the ephemeris positions of planets to other instants of Greenwich mean time is the same as that given for the Sun on pages 704–707. The local mean time of meridian passage of any planet, at any place, can be found by dividing the proper daily difference of the ephemeris times by 24, multiplying the quotient by the longitude of the place expressed in hours and fractions, and applying the product with its proper sign to the time of Greenwich passage.

Pages 178–199 contain the heliocentric coordinates of the seven major planets, and the logarithms of their distances from the Earth. The *Heliocentric Longitude* is reckoned, not from the true equinox, as in the preceding ephemerides, but from the mean equinox of the date. It is, therefore, necessary to apply nutation, if the longitude from the true equinox is required. The *Daily Motion* is given for the instant of Greenwich mean noon. The column *Reduction to Orbit* contains the correction to be applied to the heliocentric longitude in order to obtain the longitude counted along the orbit of the planet. The latter is equal to the distance from the mean equinox to the node, plus the distance from the node to the planet. The *Heliocentric Latitude* is counted from the mean ecliptic of the date. The

*Logarithm of Radius Vector* is the logarithm of the distance of the center of the planet from that of the Sun, at the Greenwich mean noon whose date is given in the first column. The last two columns give, respectively, the logarithm of the true distance of the center of the planet from that of the Earth, for the Greenwich noon indicated on the left-hand side of the page, and for the time which is midway between that date and the date next below it. In the case of Mercury, this intermediate date is mean midnight of the same day; in the case of Venus and Mars, it is the mean noon of the day immediately following; in the case of Jupiter and Saturn, it is mean noon of the second day following; and in the case of Uranus and Neptune, mean noon of the fourth day following.

Pages 200–207 contain the rectangular coordinates of the center of the Sun, referred to the center of the Earth as the origin, and to the true equator and equinox of each date as the plane and point of reference. Each coordinate is given both for Greenwich mean noon and for Greenwich mean midnight of the same day. The columns *Reduc. to Mean Eq'x of Jan. 0*, give the corrections to be applied to the coordinates for noon in order to obtain the corresponding coordinates referred to the mean equator and the mean equinox of the beginning of the Besselian fictitious year.

Pages 208–211 contain for every Greenwich mean noon and midnight the apparent geocentric longitude and latitude of the Moon referred to the true ecliptic and equinox of the date.

Page 212 contains the position of the *Moon's Equator*, the *Longitude of the Moon's Perigee*, the *Mean Longitude of the Moon's Ascending Node*, and the *Moon's Mean Longitude*.

Page 213 contains the elements of the *Moon's Libration*, and the *Sun's Aberration and Horizontal Parallax*. The formulæ for finding the libration in longitude and latitude are given on page xi. *The Sun's Aberration* is the quantity which is to be applied to the true longitude of the Sun in order to obtain its apparent longitude. The correction being negative shows that the apparent longitude as affected by aberration is always less than the true longitude. *The Sun's Horizontal Parallax*, given in the last column, is the angle subtended by the equatorial radius of the Earth, as seen from the center of the Sun.

Pages 214, 231–232 contain data for precession and the obliquity of the ecliptic, together with all sensible terms arising from the motions of the equator and ecliptic. To show clearly the relations of these quantities, let

$\lambda$  = the longitude of any body referred to the true equinox of the date.

$\lambda'$  = the longitude of the same body referred to the mean equinox of the beginning of the Besselian fictitious year.

$\psi_1$  = the adopted value of the general precession.

$\delta'\psi$  = the principal term of the nutation in longitude; or, in other words, the correction to be applied to the longitude of a body referred to the mean equinox of date, in order to obtain that longitude as referred to the true equinox, exclusive of short period terms. When the correction is positive, the longitudes referred to the true equinox are greater than those referred to the mean equinox; while the contrary is the case when the correction has a negative sign.

$\delta''\psi$  = the short period terms of nutation in longitude, given on pages 231–232.

$\omega$  = the true or apparent obliquity of the ecliptic at the date.

$\omega'$  = the mean obliquity of the ecliptic at the beginning of the Besselian fictitious year.

$\delta'\omega$  = the principal term of the nutation of the obliquity of the ecliptic; or, in other words, the correction to be applied to the mean obliquity of date in order to find the true or apparent obliquity, exclusive of short period terms. This quantity is tabulated on page 214, and is positive or negative according as the true obliquity is greater or less than the mean obliquity.

$\delta''\omega$  = the short period terms of nutation in obliquity, given on pages 231–232.

$\tau$  = the fraction of a year intervening between the instant when the Sun's mean longitude was  $280^\circ$  and the date for which  $\lambda$  or  $\omega$  is required.

Then—

$$\begin{aligned}\lambda &= \lambda' + \tau\psi_1 + \delta'\psi + \delta''\psi \\ \omega &= \omega' - 0''.464 \tau + \delta'\omega + \delta''\omega\end{aligned}$$

Page 214 contains, for each fifth Greenwich mean noon throughout the year, certain quantities which may be described in terms of the above notation as follows: The *Precession in Longitude from 1915.0*  $= \tau\psi_1$ ; the *Nutation in Longitude*  $= \delta'\psi$ ; the *Nutation in Right Ascension*  $= (\delta'\psi) \cos \omega'$ ; the *Nutation in Obliquity*  $= \delta'\omega$ , and the *Obliquity of the Ecliptic*  $= \omega - \delta''\omega$ , which is the true inclination of the Earth's equator to the ecliptic, exclusive of the terms depending on the Moon's longitude.

## PART II.—THE EPHEMERIS FOR THE MERIDIAN OF WASHINGTON.

Pages 216–217 contain formulæ for reducing the positions of fixed stars, including expressions for the Besselian star-numbers and star-constants, and for the independent star-numbers; the whole based upon the constants of the Paris Conference of May, 1896, and expressed in the notation of BESSEL.

Pages 218–221 contain the logarithms of the *Besselian Star-Numbers*, *A*, *B*, *C*, *D*, for each Washington mean midnight, with the values of *E* appended at the bottoms of the pages. The terms of short period have been included. These numbers serve to reduce the mean place of a star at the beginning of the Besselian fictitious year to its apparent place at the dates for which the numbers are given, and in ordinary cases four-figure logarithms suffice; but where extreme accuracy is desired the logarithms of *A*, *C*, and *D* are sometimes needed to five places of decimals. If used in accordance with the English and French notation, the pair of quantities *A* and *B* must be interchanged with the pair *C* and *D*; that is, *A* must be interchanged with *C*, and *B* with *D*. Along with the solar day, the first column contains the sidereal hour of Washington mean midnight for certain dates, and by interpolation among them it is easy to find the sidereal time for which any set of quantities is given.

The following is an example of the reduction of a star to apparent place by the Besselian star-numbers:

Computation of the apparent place of  $\alpha$  Aquilæ, July 2, 1915, for the upper transit at Washington.

$\log a$	0.5165	$\log b$	7.2435 $n$	$\log c$	8.0427	$\log d$	8.8236 $n$
$\log A$	9.8629	$\log B$	0.8181 $n$	$\log C$	0.5218	$\log D$	1.3042 $n$
$\log a'$	0.5153	$\log b'$	9.9941	$\log c'$	9.4340	$\log d'$	8.4140 $n$
$\log Aa$	0.3794	$\log Bb$	8.0616	$\log Cc$	8.5645	$\log Dd$	0.1278
$\log Aa'$	0.3782	$\log Bb'$	0.8122 $n$	$\log Cc'$	9.9558	$\log Dd'$	9.7182
Mean Place, 1915.0				$\alpha_0 =$	<sup>h</sup> 18 <sup>m</sup> 37 <sup>s</sup> 37.244	$\delta_0 =$	<sup>°</sup> -9 <sup>'</sup> 8 <sup>"</sup> 5.20
				$Aa =$	+ 2.395	$Aa' =$	+ 2.39
				$Bb =$	+ 0.012	$Bb' =$	- 6.49
				$Cc =$	+ 0.037	$Cc' =$	+ 0.90
				$Dd =$	+ 1.342	$Dd' =$	+ 0.52
				$E =$	+ 0.002	$\tau\mu' =$	0.00
				$\tau\mu =$	+ 0.001		
Apparent Place, July 2,					<hr/> 18 37 41.033		<hr/> -9 8 7.88
				$-f' =$	- 0.005		
				$\alpha =$	18 37 41.028		

Pages 222-229 contain the *Independent Star-Numbers*, which can frequently be advantageously used instead of the *Besselian Star-Numbers*. The terms of short period have been included. These quantities are connected with those of Bessel by the relations given on page 216, which also contains the formulæ and precepts for the application of both systems of numbers. In order to use the Besselian numbers, it is necessary to have the values of the star-constants,  $a, b, c, d, a', b', c', d'$ , while the independent star-numbers render it possible to determine the apparent place of a star without computing these star-constants. Four-figure logarithms usually suffice, but where extreme accuracy is desired the logarithms of  $g$  and  $h$  are needed to five places of decimals, and  $G$  and  $H$  are needed to one-tenth of a minute of arc. The column  $\tau$  gives the fraction of a year, counted from the beginning of the Besselian fictitious year to each date.

The following is an example of the reduction of a star to apparent place by the independent star-numbers:

Computation of the apparent place of  $\alpha$  Aquilæ, July 2, 1915, for the upper transit at Washington.

$G =$		<sup>h</sup> 22 <sup>m</sup> 23.1	$\delta_0 =$		<sup>°</sup> -9 <sup>'</sup> 8.1
$\alpha_0 =$		18 37.6	$G + \alpha_0 =$		17 <sup>h</sup> 0 <sup>m</sup> .7
$H =$		11 22.5	$H + \alpha_0 =$		6 0.1
$\log \frac{1}{r}$	8.8239	$\log \frac{1}{r}$	8.8239	$\alpha_0 =$	<sup>h</sup> 18 <sup>m</sup> 37 <sup>s</sup> 37.244
$\log g$	1.2050	$\log h$	1.3100	$f =$	+ 2.237
$\sin (G + \alpha_0)$	9.9853 $n$	$\sin (H + \alpha_0)$	0.0000	$(g) =$	+ 0.166
$\tan \delta_0$	9.2063 $n$	$\sec \delta_0$	0.0055	$(h) =$	+ 1.379
$\log (g)$	9.2205	$\log (h)$	0.1394	$\tau u =$	+ 0.001
				$\alpha =$	<hr/> 18 37 41.027
					<sup>°</sup> -9 <sup>'</sup> 8 <sup>"</sup> 5.20
$\log g$	1.2050	$\log h$	1.3100	$\delta_0 =$	- 9 8 5.20
$\cos (G + \alpha_0)$	9.4078 $n$	$\cos (H + \alpha_0)$	6.7648	$(g') =$	- 4.10
		$\sin \delta_0$	9.2007 $n$	$(h') =$	0.00
$\log (g')$	0.6128 $n$			$(i) =$	+ 1.42
		$\log (h')$	7.2755 $n$	$\tau\mu' =$	0.00
				$\delta =$	<hr/> - 9 8 7.88
$\log i$	0.1591				
$\cos \delta_0$	9.9945				
$\log (i)$	0.1536				



Page 230 contains for every tenth sidereal day the *Besselian* and *Independent Star-Numbers*, exclusive of all short-period terms. They are useful in computing ephemerides of stars, similar to those on pages 287–486, for which constants containing short-period terms should not be employed.

Pages 231–232 contain for Washington mean midnight of each day the short-period terms of the nutation in longitude and obliquity, for use in connection with the formulæ on page 217, and the coefficients mentioned below, which are given for each star on pages 287–486.

Pages 233–250 contain the mean places of eight hundred and twenty-five stars, for the beginning of the Besselian fictitious year, or, in other words, for the moment when the Sun's mean longitude is  $280^\circ$ . The annual variations are to be considered as the differential coefficients of each coordinate with respect to the time at the beginning of the year.

Pages 251–286 contain the apparent positions of fifteen northern circumpolar stars for every upper transit at Washington. The mean solar time of transit is given in the column *Mean Solar Date*, in order that each transit above and below the pole may be readily identified. Suppose, for example, that the transit of Polaris below the pole on January 26 is to be found, and we wish to know whether it precedes or follows the upper transit of the same date. On page 251 we find that the upper transit occurs January 26.2; the lower transit, therefore, occurs January 26.7. But the lower transit following that of July 1 (page 257) does not take place until July 2.3. Hence the lower transit of July 1 precedes the upper one of the same date. A transit occurring very nearly at noon may also be identified without a computation to ascertain the actual mean date, by simply noting the tenth of a day in the column *Mean Solar Date*.

The secant and tangent of the apparent declination for the 15th of each month and the mean place in right ascension and declination for the beginning of the year are given for each star at the foot of the page.

Pages 287–486 contain, for every tenth upper transit at Washington, the apparent places of 800 stars, being all those given in the list of mean places, except the twenty-five circumpolars. The mean solar date in the left-hand column of each page gives the day and tenth of the transit, so that intermediate transits may be readily identified; and to facilitate interpolation, the differences of each coordinate are given for every ten days.

In connection with the ephemeris of each 10-day star there are given at the foot of the page, (1) the secant and the tangent of the mean of the star's greatest and least apparent declinations during the year, (2) the seconds of the mean place in both right ascension and declination for the beginning of the year, and (3) the coefficients of the short-period terms of the nutation, the use of which is explained on page 217.

Pages 487–510 contain ephemerides of ten southern circumpolar stars in all respects similar to those of northern circumpolar stars on pages 251–286.

Pages 511–517 contain the mean errors for 1920 in both right ascension and declination of the places of the 825 stars on pages 233–250 taken from *Astronomical Papers of the American Ephemeris*, Vol. VIII, Part 2, pages 370–382. They furnish data for estimating approximately the accuracy of the Mean Places of the Stars on pages 233–250.

Pages 518–525 contain the *Apparent Right Ascension* and *Declination* of the Sun, both for Washington mean and apparent noon, and the *Hourly Motion* of the Sun in these coordinates; the *Equation of Time*, the *Semidiameter* of the Sun, and the *Sidereal Time of Semidiameter Passing Meridian*, for Washington apparent noon; and, lastly, the *Sidereal Time of Mean Noon*. The hours and minutes of right ascension and the degrees and minutes of declination are always made the same for both mean and apparent noon. In cases where they really differ, the minute which would have been numerically larger is diminished by one, and the seconds increased by sixty, so that the sum of the two remains correct. The hourly motions in right ascension and declination are given for the columns headed *Mean Noon*, but may be regarded as having the same values for apparent noon.

The *Equation of Time for Apparent Noon* is the correction to be applied to apparent time in order to obtain mean time. It is, therefore, mean time minus apparent time. Each number as given is the mean time of transit of the Sun's center over the meridian of Washington, counted from the nearest noon. The use of all the quantities is substantially the same as in the *Ephemeris for the Meridian of Greenwich*.

Pages 526–541 contain the right ascension, declination, semidiameter, and parallax of the Moon at the moment of upper and lower transit over the meridian of Washington. The mean time given in the third column is that of transit of the Moon's center over this meridian. The differences for one hour of longitude are the amounts by which the local mean times of transit over a meridian one hour west of Washington would exceed those given in the column *Mean Time of Transit*, supposing the rate of change to be uniform and equal to what it is at the instant of transit over the meridian of Washington. The next four columns need no especial explanation, except that the differences for one hour of longitude are computed as if the motion of the Moon in right ascension were uniform, or, in other words, they are differential coefficients corresponding to the instants of Washington transit. By means of them, when second differences are taken into account, the position of the Moon can be computed with great exactness for the moment of transit over any meridian not more than one hour distant from Washington. To obtain the same accuracy for more distant meridians, we may proceed as follows: Let  $F$  represent either the *Mean Time of Transit*, the *Right Ascension of Center*, or the *Geocentric Declination of Center*, and let  $D$  represent the corresponding *Difference for One Hour of Longitude*. Write down three successive values of  $F$ , together with the corresponding values of  $D$ , and difference the latter as in the following scheme, where the middle values,  $F_0$  and  $D_0$ , belong to the culmination from which is to be derived the value of  $F$  for the culmination on the meridian whose longitude is  $\lambda$ :—

Function.	Diff. for 1 Hour of Longitude.	$\Delta'$	$\Delta''$
$F_{-1}$	$D_{-1}$	$a'$	$b$
$F_0$	$D_0$	$a''$	
$F_{+1}$	$D_{+1}$		

Then, for the culmination at the meridian  $\lambda$

$$F_{\lambda} = F_0 + \lambda D_0 + \frac{\lambda^2}{48}(a' + a'') + \frac{\lambda^3 b}{864}$$

[Eph 15]



where  $\lambda$  must be expressed in hours and decimals of an hour, and reckoned from Washington or from  $180^\circ$  from Washington according as the upper or lower culmination is used for the middle value ( $F_0$ ). Adding twelve hours to the Washington time of lower transit at Washington gives the local time of upper transit at places whose longitude is  $180^\circ$  from Washington.

The columns of *Sidereal Time of Semidiameter Passing Meridian*, *Geocentric Semidiameter* and *Equatorial Horizontal Parallax* need no explanation, except that they are all given for the moment of transit. The column *Bright Limbs* is given to indicate to the observer which limbs are illuminated. When one limb is full and the terminator is within  $1''$  of the opposite limb, both can be well observed, and in such cases both are indicated, the defective limb being indicated by an italic letter or numeral, and the correction for defective illumination (as seen from Washington) being given in a foot-note.

Pages 542–558 contain for each of the seven major planets, the geocentric *Apparent Right Ascension* and *Declination*, the *Horizontal Parallax*, *Semidiameter*, and *Sidereal Time of Semidiameter Passing Meridian*, for the moments of all transits which it is usually desirable to observe over the meridian of Washington. The columns following the dates give the Washington mean times of these transits. The stellar magnitude at opposition for Mars, Jupiter, Saturn, Uranus, and Neptune, respectively, is given at the bottom of the page containing the ephemeris of the planet.

### PART III.—PHENOMENA.

This part gives the dates of the principal astronomical phenomena of the year, expressed in Washington mean time, except in the case of the eclipses, which are expressed in Greenwich mean time.

Pages 560–564 contain all necessary data respecting the solar eclipses which occur during the year.

The eclipse elements are given for the moment of conjunction of the Sun and Moon in right ascension, but the subsequent tables and results are computed from the exact positions of these bodies at the several instants referred to. The times and angles designated as the circumstances of a lunar eclipse remain the same throughout all parts of the Earth, and require no explanation beyond a mere statement of the fact that in computing them the geometrical diameter of the Earth's shadow has been augmented in the proportion of 51 : 50. The principal circumstances of each total and annular eclipse are stated in five lines, as follows:—

The line entitled “Eclipse begins” gives the Greenwich mean time at which the Moon's penumbra first touches the Earth, together with the latitude and longitude of the point of contact.

The line entitled “Central eclipse begins” gives the time when the axis of the Moon's shadow first touches the Earth, and the latitude and longitude of the point of contact follow.

The line entitled “Central eclipse at local apparent noon” gives the time when the axes of the Earth and of the shadow cone lie in the same plane. The latitude and longitude of the point where the axis of the shadow cone then cuts the Earth's surface follow, and there the eclipse will be central and the Sun will be exactly on the meridian.

The lines entitled “Central eclipse ends” and “Eclipse ends” give, respectively, the times when and the localities where these events occur, the phenomena being the converse of those denoted by the similar phrases for the beginning.

In the case of partial solar eclipses the axis of the Moon's shadow does not come into contact with the Earth, and the three lines entitled, respectively, "Central eclipse begins," "Central eclipse at local apparent noon," and "Central eclipse ends," are replaced by a single line entitled "Greatest eclipse," whereon are given the time when and the latitude and longitude where the eclipse attains its greatest magnitude. The latter phenomenon necessarily occurs with the Sun in the horizon.

*Maps of the Eclipses.*—The regions in which each eclipse is visible are shown upon the map relating to it, from which may be taken approximately, for any place, both the times of the beginning and ending of the eclipse and its magnitude. The dotted curves show the outline of the shadow for each hour of Greenwich mean time, and therefore pass through all places where the eclipse begins or ends at the hour indicated. To find the instant of beginning at any place, we determine by inspection between what pair of these curved lines the place is situated. The eclipse will then begin between the corresponding hours of Greenwich mean time; and the fraction of the hour may be determined by dividing the hour in the same proportion as the space representing it on the map is divided by the place in question. This division may be made a little more exact by allowing for the changes in the spaces as indicated by their varying width. The Greenwich mean time thus found must be reduced to local mean time by applying the longitude.

As an example, suppose we wish to find the times at which the eclipse of 1915, August 10, begins and ends at a point near Honolulu, latitude  $21^{\circ} 18' \text{ N.}$ , longitude  $157^{\circ} 55' \text{ W.}$

For the beginning we compare the distance of the place from the curves of  $9^{\text{h}}$  and  $10^{\text{h}}$ , and find it to correspond to about 10 minutes from the former, thus giving for the approximate time of beginning  $9^{\text{h}} 10^{\text{m}}$ ; for the end we compare the distance of the place from the curves of  $12^{\text{h}}$  and  $13^{\text{h}}$ , and find it to be about 20 minutes from the former, thus giving for the approximate time of ending  $12^{\text{h}} 20^{\text{m}}$ , and both of these results are probably correct to within 3 or 4 minutes.

Changing to local mean time, we shall have—

					<i>Beginning.</i>			<i>Ending.</i>		
					d	h	m	d	h	m
Greenwich mean time	.	.	.	August	10	9	10	10	12	20
Longitude west	.	.	.			10	32		10	32
					<hr/>			<hr/>		
Local mean time	.	.	.	August	9	22	38	10	1	48

In the case of total and annular eclipses, a fair estimate of the magnitude of the eclipse at any place may be obtained from the position thereof relatively to the central line and to the limit. On the central line the eclipse is annular or total, while between the central line and the limit the maximum magnitude of the eclipse is given by the quotient of the distance of the place from the limit divided by the distance of the central line from the limit; the measurements being made upon a line drawn through the place, perpendicularly to the central line.

*More Accurate Computations.*—A more accurate determination of the phases, as visible at any point of the Earth's surface, may be obtained from the Besselian elements which are given for every 10 minutes of Greenwich mean time. Their geometric signification is as follows:—

Let us imagine a plane passing through the center of the Earth, perpendicular to the right line joining the centers of the Sun and Moon. This latter line is the *axis of the Moon's shadow*, and the plane is called the *fundamental plane* or *plane*

of  $xy$ . We take the intersection of this plane with that of the Earth's equator as the axis of  $x$ , and the center of the Earth as the origin of coordinates. The axis of  $y$  is perpendicular to that of  $x$ , and directed toward the north;  $x$  and  $y$  are then the coordinates of the point in which the axis of the shadow intersects the fundamental plane, and they are here expressed in terms of the Earth's equatorial radius as unity. The angle  $d$ , of which the sine and cosine are both given, is the declination of that point of the celestial sphere toward which the axis of the shadow is directed; or, in other words, it is the declination of the center of the Sun as seen from the center of the Moon. The angle  $\mu$  is the Greenwich hour-angle of this same point of the celestial sphere.

The quantities  $l_1$  and  $l_2$  are the radii of the shadow cones upon the fundamental plane,  $l_1$  corresponding to the penumbra, and  $l_2$  to the umbra, or annulus. The notation is that of CHAUVENET'S *Spherical and Practical Astronomy*, in which  $l_2$  is regarded as positive for an annular and negative for a total eclipse.

The angles  $f_1$  and  $f_2$ , the tangents of which are given, are the angles which the elements of the respective shadow cones make with the axis of the shadow; or, they are the semiangles of the two cones.

In order to facilitate interpolation to any required moment, the logarithms of  $x'$ ,  $y'$ , and  $\mu'$ , which are the changes of  $x$ ,  $y$ , and  $\mu$ , in one minute of time, are given at the bottom of the table.

The method of computing an eclipse from its Besselian elements is based on the fact that at the moments of beginning and ending the distance of the observer from the axis of the shadow or penumbra is equal to the radius of the latter at the point of observation. To find this distance and radius we proceed as follows:

(1) The coordinates of the observer,  $\xi$ ,  $\eta$ , and  $\zeta$ , together with their variations in one minute, are computed for some assumed moment of Greenwich mean time, as near as practicable to the true time of the required phase.

(2) The coordinates  $x$  and  $y$  of the axis of the shadow, together with their variations in one minute, are taken for the same moment from the tables of elements.

(3) From (1) and (2) the position and motion of the observer relative to the axis of the shadow are found.

(4) The radius of the penumbra or umbra at a distance from the fundamental plane equal to that of the observer is also computed.

(5) Then, assuming the motions to be uniform, we determine the time required for the observer to be brought to a distance from the axis of the shadow equal to this radius.

The formulæ and directions for the several steps in the computation are as follows:—

(1) Find  $\rho \cos \varphi'$  and  $\rho \sin \varphi'$ , which are the geocentric coordinates of the station referred to the Earth's equator,  $\rho$  being the distance from the center of the Earth and  $\varphi'$  the geocentric latitude. These coordinates may be computed from the following table based on the compression of the Earth adopted at the Paris Conference of 1911,  $1/297$ , by the formulæ—

$$\rho \cos \varphi' = F \cos \varphi$$

$$\rho \sin \varphi' = \frac{\sin \varphi}{G}$$

$\varphi$  being, as usual, the geographic latitude.

Table for Computing the Geocentric Coordinates of a Place.

$\varphi$	Log F.	Log G.
0°	0.00000	0.00293
5	0.00001	0.00292
10	0.00004	0.00289
15	0.00010	0.00283
20	0.00017	0.00276
25	0.00026	0.00267
30	0.00037	0.00256
35	0.00048	0.00245
40	0.00060	0.00232
45	0.00073	0.00220
50	0.00086	0.00207
55	0.00098	0.00195
60	0.00110	0.00183
65	0.00120	0.00173
70	0.00129	0.00164
75	0.00137	0.00156
80	0.00142	0.00151
85	0.00145	0.00148
90	0.00146	0.00146

For the assumed Greenwich mean time of computation, take from the table of elements the values of  $\sin d$ ,  $\cos d$ , and  $\mu$ . Then, with  $\lambda$  for the longitude west from Greenwich, the coordinates of the observer will be—

$$\begin{aligned}\xi &= \rho \cos \varphi' \sin (\mu - \lambda) \\ \eta &= \rho \sin \varphi' \cos d - \rho \cos \varphi' \sin d \cos (\mu - \lambda) = \eta_1 - \eta_2 \\ \zeta &= \rho \sin \varphi' \sin d + \rho \cos \varphi' \cos d \cos (\mu - \lambda) = \zeta_1 + \zeta_2\end{aligned}$$

and their variations in one minute of mean time will be—

$$\begin{aligned}\xi' &= [7.63992] \rho \cos \varphi' \cos (\mu - \lambda) \\ \eta' &= [7.63992] \rho \cos \varphi' \sin d \sin (\mu - \lambda) = [7.63992] \xi \sin d \\ \zeta' &\text{ is not needed.}\end{aligned}$$

(2) For the same assumed moment of Greenwich mean time, take from the tables of elements the coordinates  $x$  and  $y$  of the axis of the shadow, together with their variations for one minute, which are equal to one-tenth of the differences of two consecutive numbers. These variations are represented by  $x'$  and  $y'$ , and their logarithms are given beneath the tables of  $x$  and  $y$ .

(3) The distance  $m$  and position-angle  $M$  of the axis of the shadow relatively to the observer, and the relative motions,  $n$  and  $N$ , are computed by the formulæ—

$$\begin{aligned}m \sin M &= x - \xi \\ m \cos M &= y - \eta \\ n \sin N &= x' - \xi' \\ n \cos N &= y' - \eta'\end{aligned}$$

(4) Both for the shadow and for the penumbra, the radius  $L$  at the distance  $\zeta$  from the fundamental plane is computed by the formula—

$$L = l - \zeta \tan f$$

$l$  and  $f$  being found from the table of elements, and  $\zeta$  computed in (1).

(5) If the time chosen for computation is exactly that of the beginning or ending of the eclipse, we shall have—

$$\begin{aligned}m &= L \\ &[\text{Eph 15}]\end{aligned}$$

But, as this condition will rarely be fulfilled on a first trial, a correction  $\tau$  to the assumed time is computed thus: Find the angle  $\psi$  from the equation,

$$\sin \psi = \frac{m \sin (M - N)}{L}$$

There will be two values for this angle, of which one will be in the first and the other in the second quadrant when  $\sin \psi$  is positive, and one in the third and the other in the fourth quadrant when  $\sin \psi$  is negative; but simplicity will be gained by taking only that value of  $\psi$  for which  $\cos \psi$  is positive. This value lies between the limits  $+90^\circ$  and  $-90^\circ$ . The correction  $\tau$  to the assumed time of beginning or ending of the eclipse will then be found, in minutes, from—

$$\tau = -\frac{m \cos (M - N)}{n} \mp \frac{L \cos \psi}{n}$$

where the double sign is to be taken negative for the beginning and positive for the ending.

However, one such pair of values of  $\tau$  can not give the times of both beginning and ending with accuracy. To attain that, we must commence the computation by assuming two times, one near the beginning and the other near the ending of the eclipse, both of which may be derived from the chart with sufficient exactness. The computation for the first assumed time will give a small value of  $\tau$  which, when applied to the assumed time, will give the beginning of the eclipse nearly correctly, and a large value which will give an inaccurate time of ending. Similarly the computation for the second assumed time will give a small and nearly correct value of  $\tau$  for finding the time of ending, and a large and inaccurate negative value for finding the time of beginning. We shall thus deduce two times of each phase, only one of which is to be regarded as approximately correct.

The more accurate times of beginning and ending may now be taken in place of those originally assumed, and the whole computation may be repeated, thus leading to a pair of values of  $\tau$ , which should be very small and accurate. Such a repetition of the computation will in general be advisable, to guard against accidental numerical errors, but a second approximation may be obtained without it, by finding a corrected value of  $\tau$  in accordance with the formulæ—

$$\delta \tau = \mp \frac{\tau(l' + [5.3100]\xi \cos d)}{n \cos \psi} - \frac{[4.9788]\tau^2}{n \cos \psi} [\xi \sin (N \mp \psi) - \eta_2 \cos (N \mp \psi)]$$

$$\tau_0 = \tau + \delta \tau$$

where the double signs are to be taken negative for the beginning of the eclipse and positive for the ending.  $l'$  is the variation of  $l$  for one minute of time, and its numerical value can be taken by inspection from the table of Besselian elements.

If the resulting values of  $\tau_0$  are not greater than fifteen minutes, the corrected times of contact thus obtained will be theoretically exact within less than a second, but the uncertainties of the solar and lunar tables are such that an unavoidable error of several seconds may exist in the prediction. To guard against numerical mistakes it is better, after making this final correction, to repeat the computations so far as to obtain new values of  $m$  and  $L$  for the corrected times. If these two quantities agree within a unit of the fourth place of decimals, the times employed are generally correct within a second of time. If they differ too widely, the *computer* must use his own judgment as to making further corrections and *computations*.

*Position-angle of Point of Contact.*—The position-angle  $P$ , of the point of contact, reckoned from the north point of the Sun's limb toward the east, is found by the formulæ—

$$P = N - \psi \pm 180^\circ \text{ for the beginning,}$$

or
$$P = N + \psi \qquad \text{for the ending,}$$

being assumed that, in each case, the value of  $\psi$  is taken between the limits  $\pm 90^\circ$ .

*Computation of the Solar Eclipse of 1915, August 10, for a point near Honolulu.*

The position of the point chosen is—

Latitude,  $\varphi = +$

21180

Longitude,  $\lambda = +$

157550

Its geocentric coordinates are—

$$\rho \sin \varphi' = 9.55747$$
$$\rho \cos \varphi' = 9.96946$$

From the Eclipse Chart we find the approximate times of the phases to be—

Beginning August

10910

Ending

101220

}

Greenwich Mean Time.

Greenwich Mean Time, $T$ , August 10,	Beginning.			Ending.		
	9 <sup>h</sup>	10 <sup>m</sup>		12 <sup>h</sup>	20 <sup>m</sup>	
	°	'	"	°	'	"
$\mu$	136	10	24	183	40	54
$\lambda$	+157	55	0	+157	55	0
$\mu - \lambda$	−21	44	36	+25	45	54
$\rho \cos \varphi'$	9.96946			9.96946		
$\sin (\mu - \lambda)$	9.56873	$n$		9.63817		
$\log \xi$	9.53819	$n$		9.60763		
$\xi$	−0.34529			+0.40516		
$\rho \sin \varphi'$	9.55747			9.55747		
$\cos d$	9.98347			9.98355		
$\log \eta_1$	9.54094			9.54102		
$\eta_1$	+0.34749			+0.34755		
$\rho \cos \varphi'$	9.96946			9.96946		
$\sin d$	9.43254			9.43154		
$\cos (\mu - \lambda)$	9.96795			9.95453		
$\log \eta_2$	9.36995			9.35553		
$\eta_2$	+0.23439			+0.22674		
$\eta = \eta_1 - \eta_2$	+0.11310			+0.12080		
$\rho \sin \varphi' \sin d$	8.99001			8.98901		
$\zeta_1$	+0.09773			+0.09750		
$\rho \cos \varphi' \cos d \cos (\mu - \lambda)$	9.92088			9.90754		
$\zeta_2$	+0.83345			+0.80824		
$\zeta = \zeta_1 + \zeta_2$	+0.93118			+0.90574		
const. log	7.63992			7.63992		
$\rho \cos \varphi' \cos (\mu - \lambda)$	9.93741			9.92399		
$\log \xi'$	7.57733			7.56391		

	Beginning.	Ending
$\xi'$	+ 0.003779	+ 0.003664
const. log	7.63992	7.63992
$\xi \sin d$	8.97073 <i>n</i>	9.03917
log $\eta'$	6.61065 <i>n</i>	6.67909
$\eta'$	− 0.000408	+ 0.000478
$x - \xi$	− 0.47834	+ 0.31098
$y - \eta$	+ 0.25541	− 0.41735
$x' - \xi'$	+ 0.004325	+ 0.004437
$y' - \eta'$	− 0.003087	− 0.003983
$m \sin M$	9.67974 <i>n</i>	9.49273
$m \cos M$	9.40724	9.62050 <i>n</i>
tan $M$	0.27250 <i>n</i>	9.87223 <i>n</i>
$M$	− 61° 54' 0''	+ 143° 18' 33''
sin $M$	9.94553 <i>n</i>	9.77634
log $m$	9.73421	9.71639
$n \sin N$	7.63599	7.64709
$n \cos N$	7.48954 <i>n</i>	7.60021 <i>n</i>
tan $N$	0.14645 <i>n</i>	0.04688 <i>n</i>
$N$	+ 125° 31' 2''	+ 131° 54' 48''
sin $N$	9.91060	9.87166
log $n$	7.72539	7.77543
tan $f$	7.66403	7.66404
log $\zeta$	9.96903	9.95700
	7.63306	7.62104
$\zeta \tan f$	+ 0.00430	+ 0.00418
$l$	+ 0.55479	+ 0.55445
$L$	+ 0.55049	+ 0.55027
$M - N$	− 187° 25' 2''	+ 11° 23' 45''
sin ( $M - N$ )	9.11090	9.29576
log $m$	9.73421	9.71639
colog $L$	0.25925	0.25942
sin $\psi$	9.10436	9.27157
$\psi$	+ 7° 18' 21''	+ 10° 46' 16''
log $\frac{m}{n}$	2.00882	1.94096
cos ( $M - N$ )	9.99635 <i>n</i>	9.99136
	2.00517 <i>n</i>	1.93232
$-\frac{m}{n} \cos (M - N)$	+ 101.198	− 85.570
log $L$	9.74075	9.74058
cos $\psi$	9.99646	9.99228
colog $n$	2.27461	2.22457
	2.01182	1.95743



$\mp \frac{L \cos \psi}{n}$	Beginning.	Ending.
	- 102.760	+ 90.662
$\tau$	$\begin{smallmatrix} m \\ - 1.562 \end{smallmatrix}$	$\begin{smallmatrix} m \\ + 5.092 \end{smallmatrix}$
$T + \tau$	$\begin{smallmatrix} d & h & m \\ 10 & 9 & 8.438 \end{smallmatrix}$	$\begin{smallmatrix} d & h & m \\ 10 & 12 & 25.092 \end{smallmatrix}$

Since the value of  $\tau$  for the ending is rather large, we compute the correction  $\delta \tau$  for this phase as follows:

	Ending.		Ending.
const. log	5.3100	$\cos (N + \psi)$	9.9005 <i>n</i>
log $\xi$	9.6076	log $\eta_2$	9.3555
cos <i>d</i>	9.9836	log $\eta_2 \cos (N + \psi)$	9.2560 <i>n</i>
	4.9012	$\xi \sin (N + \psi)$	+ 0.2456
number	+ 0.0000080	$\eta_2 \cos (N + \psi)$	- 0.1803
<i>l'</i>	- 0.0000023	diff.	+ 0.4259
sum	+ 0.0000057		
log (sum)	4.7559	log (diff.)	9.6293
log $\tau$	0.7069	const. log	4.9788 <i>n</i>
colog <i>n</i>	2.2246	log $\tau^2$	1.4138
sec $\psi$	0.0077	colog ( <i>n</i> cos $\psi$ )	2.2323
	7.6951		8.2542 <i>n</i>
(1)	+ 0.0050	(2)	- 0.0180
$N + \psi$	142° 41'		
sin ( $N + \psi$ )	9.7826	(1) + (2) = $\delta \tau$	$\begin{smallmatrix} m \\ - 0.013 \end{smallmatrix}$
log $\xi$	9.6076	$\tau$	+ 5.092
log $\xi \sin (N + \psi)$	9.3902	$\tau_0$	+ 5.079

The corrected time of ending is, therefore,  
 $T_0$  = August 10<sup>d</sup> 12<sup>h</sup> 25<sup>m</sup>.079

Whence we find—

		Beginning.	Ending.
Greenwich Mean Time,	August	$\begin{smallmatrix} d & h & m \\ 10 & 9 & 8.438 \end{smallmatrix}$	$\begin{smallmatrix} d & h & m \\ 10 & 12 & 25.079 \end{smallmatrix}$
$\lambda$		+ $\begin{smallmatrix} & & & \\ & 10 & 31.667 \end{smallmatrix}$	+ $\begin{smallmatrix} & & & \\ & 10 & 31.667 \end{smallmatrix}$
Local Mean Time,	August	9 22 36.771	10 1 53.412

Therefore we have—

Beginning of the Eclipse,	August	$\begin{smallmatrix} d & h & m & s \\ 9 & 22 & 36 & 46.3 \end{smallmatrix}$	} Local Mean Time.
End of the Eclipse,	August	$\begin{smallmatrix} d & h & m & s \\ 10 & 1 & 53 & 24.7 \end{smallmatrix}$	

	Beginning.	Ending.
$N \mp \psi$	118 12.7	142 41.1
constant	180 0.0	0 0.0
Angle of position: <i>P</i>	298 12.7	142 41.1

from the north point of the Sun's disk toward the east for direct image.

Pages 565–569 contain the adopted mean places and annual proper motions of such stars as bright as magnitude 6.5 as will be occulted during the year by the Moon.



Pages 570–608 contain the elements for the prediction of the times of occultations of stars and planets by the Moon during the current year. The system of coordinates employed is similar to that already described for eclipses, the fundamental plane passing through the center of the Earth, and being taken perpendicular to the line joining the star and the center of the Moon, but the cone circumscribing the Moon and star is regarded as a cylinder which intercepts the fundamental plane in a circle having the same linear diameter as the Moon.

In the columns referring to the star, those headed *Red'ns from 1915.0* give the quantities necessary to reduce the mean place of the star at the beginning of 1915 to its apparent place at the time of occultation. These reductions are sufficiently accurate to be definitive.

Under the general head, *At Conjunction in R. A.*, are five columns giving certain quantities for the moment of geocentric conjunction of the Moon and star in right ascension, as follows:

The *Washington Mean Time* is the moment,  $T$ , at which the two bodies are in geocentric conjunction in right ascension. At that moment the coordinate  $x$  of the axis of the cylinder on the fundamental plane has the value zero. The column *Hour Angle,  $H$* , gives the common geocentric hour-angle of the Moon and star at the same moment, expressed in sidereal time and counted from the meridian of Washington—positive toward the west and negative toward the east. Column  $Y$  gives the coordinate  $y$  of the axis of the cylinder upon the fundamental plane at the same moment. Columns  $x'$  and  $y'$  give the variations of  $x$  and  $y$  in one hour of mean time. The linear unit in these columns is the Earth's equatorial radius. The limiting parallels, north and south, show the extreme limits of latitude within which the occultation will be visible.

By the aid of these elements, the Washington mean time of immersion and emersion of a star relatively to the limb of the Moon may be computed for any part of the Earth by a method nearly the same as that already explained for computing eclipses, but somewhat more simple.

*Prediction of Occultations for a given Place.*—When it is desired to predict the circumstances of one or more occultations at any place, the first step will be to select them from the general list given in the Ephemeris. The conditions of visibility are:—

1. The limiting parallels in the last columns must include the latitude of the place.

2. The quantity  $H - \lambda$ , taken without regard to sign, must be less than the semidiurnal arc of the star by at least one hour. On very rare occasions an emersion might be seen in the east, or an immersion in the west, when this difference is a few minutes less than an hour.

3. The Sun must not be much more than an hour above the horizon at the local mean time  $T - \lambda$ , unless the star is bright enough to be seen in the daytime.

When many occultations are to be selected, the most convenient course will be to write the value of  $-\lambda$  on the bottom of a slip of paper, and in passing through the list of occultations to pause over each one for which condition (1) is fulfilled, and examine by means of the slip whether conditions (2) and (3) are also fulfilled. If either fails, the computer passes on. Sometimes it will be difficult to determine whether  $H - \lambda$  or  $T - \lambda$  falls within the limits; and in such cases the computer may

mark the occultation for trial and leave the decision for the subsequent operations. The whole list can be gone over in less than a day, and it will probably be found that about one-tenth of the occultations are marked for trial.

The next step will be to compute the local times of immersion and emersion from the elements, and to that end let—

$T$  = the instant of geocentric conjunction of Moon and star in right ascension, expressed in Washington mean solar time;

$H$  = the Washington west hour-angle of the two bodies at that moment;

$\lambda$  = the longitude west of Washington;

$h_0 = H - \lambda$  = the local hour-angle of the star at the instant  $T$ ;

$\delta$  = the star's declination.

The procedure for each occultation will then be as follows:—

(1) The geocentric coordinates of the place,  $\rho \sin \varphi'$  and  $\rho \cos \varphi'$ , are to be computed by the formulæ and table given in connection with eclipses on page 716.

The next step will be to find the approximate instant of apparent conjunction of the Moon and star as seen from the place, and that may be deduced from the time of geocentric conjunction by the application of an approximate correction taken from DOWNES'S table, printed in the volumes of the American Ephemeris for 1882 to 1899. This correction must be reckoned in mean solar hours, and will be designated by the symbol  $t$ . It will have the same sign as  $h_0$ .

When DOWNES'S table is not available, the correction may be computed from the formulæ,

$$\xi_0 = \rho \cos \varphi' \sin h_0$$

$$\xi' = [9.4192] \rho \cos \varphi' \cos \frac{4}{3} h_0$$

$$t = \frac{\xi_0}{x' - \xi'}$$

By applying  $t$  to the Washington mean time of geocentric conjunction, as given with the elements, we shall have the Washington mean time of local conjunction within a few minutes.

(2) Compute for the instant  $T + t$  the following quantities, in which  $t_0$  is the sidereal equivalent of the mean time interval  $t$ :

$$\xi = \rho \cos \varphi' \sin (h_0 + t_0)$$

$$\eta = \rho \sin \varphi' \cos \delta - \rho \cos \varphi' \sin \delta \cos (h_0 + t_0) = \eta_1 - \eta_2$$

$$\xi' = [9.4192] \rho \cos \varphi' \cos (h_0 + t_0)$$

$$\eta' = [9.4192] \rho \cos \varphi' \sin \delta \sin (h_0 + t_0) = [9.4192] \xi \sin \delta$$

$$x = x' t$$

$$y = Y + y' t$$

Compute also  $m$ ,  $M$ ,  $n$ ,  $N$ , and  $\psi$  from the equations,

$$m \sin M = x - \xi$$

$$m \cos M = y - \eta$$

$$n \sin N = x' - \xi'$$

$$n \cos N = y' - \eta'$$

$$\sin \psi = [0.5646] m \sin (M - N)$$

$\psi$  being taken between the limits  $\pm 90^\circ$ . Finally compute,

$$\tau = -\frac{[1.7782]m}{n} \cos(M-N) \mp \frac{[1.2135]}{n} \cos \psi$$

$$\delta\tau = \frac{[6.7591]\tau^2}{n \cos \psi} [\eta_2 \cos(N \mp \psi) - \xi \sin(N \mp \psi)]$$

where the double signs are to be taken negative for an immersion and positive for an emersion. Both  $\tau$  and  $\delta\tau$  thus have two values, which are expressed in minutes of time, and in order to distinguish them let those pertaining to immersion be designated respectively  $\tau'$  and  $\delta\tau'$ , while those pertaining to emersion are designated  $\tau''$  and  $\delta\tau''$ . We then have for the Washington mean times of the phases,

$$\begin{aligned} \text{Instant of immersion} &= T + t + \tau' + \delta\tau' \\ \text{Instant of emersion} &= T + t + \tau'' + \delta\tau'' \end{aligned}$$

These expressions are practically exact, as the corrections  $\delta\tau$  seldom amount to so much as 1.5 minutes, and whenever an inaccuracy of that magnitude is permissible they may be omitted. As a check upon the results, it will be advisable to compute  $\xi$ ,  $\eta$ ,  $x$ , and  $y$  for the times of immersion and emersion finally obtained. If these times are correct the quantities in question will fulfill the condition,

$$\sqrt{(x-\xi)^2 + (y-\eta)^2} = 0.2725$$

If  $\log m \sin(M-N) > 9.4354$ ,  $\sin \psi$  will be numerically greater than unity, and no occultation is to be expected at the given place; but a very brief one may occur if the excess of the computed distance over the Moon's semidiameter happens to be within the errors of the ephemerides of the Moon and star.

The position-angle of the line from the Moon's center to the star, at the time of contact, is reckoned from the north point toward the east, and designated by the symbol  $P$ . It is computed from the formulæ,

$$\begin{aligned} P &= N - \psi + \delta P && \text{for immersion,} \\ \text{or} \quad P &= N + \psi + \delta P \pm 180^\circ && \text{for emersion,} \end{aligned}$$

where the angles  $N - \psi$  and  $N + \psi$  are taken directly from the computation of  $\delta\tau$ , and  $\delta P$  is found in degrees of arc from the expression,

$$\delta P = \mp \frac{[7.3038]\tau^2}{\cos \psi} [\eta_2 \sin N + \xi \cos N]$$

In the latter formula the double sign is to be taken negative for an immersion and positive for an emersion.

The angle from the vertex,  $V$ , is also reckoned in the direction from the north toward the east, and is found from the formula,

$$V = P - C$$

where  $C$  is computed from the expression,

$$\tan C = \frac{\xi + [8.2218]\tau\xi' - [4.9810]\tau^2\xi}{\eta + [8.2218]\tau\eta' + [4.9810]\tau^2\eta_2}$$

$C$  being taken less or greater than  $180^\circ$ , according as the numerator is positive or negative.

The value of  $\tau$  employed in the latter formula must be so taken as to correspond with the phase for which  $C$  is required.

In the volumes of the American Ephemeris for the years 1882 to 1901 instructions are given for constructing three special tables which greatly diminish the labor of computing occultations, but as these tables should contain from 4700 to 6300 quantities, and as they would apply only to the place for which they were computed, it will rarely be worth while to undertake the labor of forming them. Those who desire further information on the subject may consult any one of the volumes in question.

As an example of an isolated occultation, we will compute that of 38 B. Sagittarii on March 8, 1915, for New Haven, whose position is—

φ = +41° 19' 22''.3  
λ = − 0<sup>h</sup> 16<sup>m</sup> 35<sup>s</sup>.2

and whose geocentric coordinates are—

ρ sin φ' = 9.8174  
ρ cos φ' = 9.8763

From the elements on page 584 we have,

T =       <sup>h</sup>   <sup>m</sup>  
          18 53.1  
H = −   0   5.2  
and       h<sub>0</sub> = H − λ = + 0 11.4

From the formulæ on page 723, we find the correction, *t*, to the Washington mean time of geocentric conjunction, *T*, to be about +0<sup>h</sup> 5<sup>m</sup>.7; therefore the Washington mean time of apparent conjunction is—

T + *t* = March 8<sup>d</sup> 18<sup>h</sup> 58<sup>m</sup>.8

38 B. Sagittarii.	Apparent Declination.	W. T. of ♂	Hour Angle.	Y	x'	y'
	−28 28.1	<sup>d</sup> <sup>h</sup> <sup>m</sup> Mar. 8 18 53.1	<sup>h</sup> <sup>m</sup> − 0 5.2	+0.6871	0.5903	+0.0332

T + <i>t</i> Mar. 8 <sup>d</sup> 18 <sup>h</sup> 58 <sup>m</sup> .8		η <sub>2</sub>	−0.3575
h <sub>0</sub>	+0 11.4	η <sub>1</sub> − η <sub>2</sub> = η	+0.9348
t <sub>0</sub>	+0 5.7	const. log	9.4192
h <sub>0</sub> + t <sub>0</sub>	+0 17.1	ρ cos φ' cos (h <sub>0</sub> + t <sub>0</sub> )	9.8751
ρ cos φ'	9.8763	log ξ'	9.2943
sin (h <sub>0</sub> + t <sub>0</sub> )	8.8724	ξ'	+0.1969
log ξ	8.7487	const. log	9.4192
ξ	0.0561	ξ sin δ	8.4269 <i>n</i>
ρ sin φ'	9.8174	log η'	7.8461 <i>n</i>
cos δ	9.9440	η'	−0.0070
log η <sub>1</sub>	9.7614	log x'	9.7711
η <sub>1</sub>	+0.5773	log <i>t</i>	8.9781
ρ cos φ'	9.8763	log <i>x</i>	8.7492
sin δ	9.6782 <i>n</i>	<i>x</i>	+0.0561
cos (h <sub>0</sub> + t <sub>0</sub> )	9.9988	log y'	8.5211
log η <sub>2</sub>	9.5533 <i>n</i>	log y'/ <i>t</i>	7.4992

$T+t$ Mar.	8 <sup>d</sup> 18 <sup>h</sup> 58 <sup>m</sup> .8	const. log	0.5646
$y't$	+0.0032	log $m$	9.3883
$Y$	+0.6871	sin $(M-N)$	9.9977
$y$	+0.6903	sin $\psi$	9.9506
$x-\xi$	0.0000	$\psi$	63° 11'
$y-\eta$	-0.2445	const. log	1.7782
$x'-\xi'$	+0.3934	log $\frac{m}{n}$	9.7912
$y'-\eta'$	+0.0402	cos $(M-N)$	9.0070 $n$
$m \sin M$	—		0.5764 $n$
$m \cos M$	9.3883 $n$		
$\tan M$	—	$-\frac{[1.7782]m}{n} \cos (M-N)$	+3.77
$M$	180° 0'	const. log	1.2135
$\cos M$	0.0000 $n$	colog $n$	0.4029
log $m$	9.3883	cos $\psi$	9.6543
$n \sin N$	9.5948		1.2707
$n \cos N$	8.6042	$\mp \frac{[1.2135] \cos \psi}{n}$	$\mp 18.65$
$\tan N$	0.9906		
$N$	84° 10'	$\tau$ for immersion	-14.88 <sup>m</sup>
$\sin N$	9.9977	$\tau$ for emersion	+22.42
log $n$	9.5971		

The computation of  $\delta\tau$  for the two contacts is as follows:

	Immersion.	Emersion.
$N \mp \psi$	20° 59'	147° 21'
cos $(N \mp \psi)$	9.9702	9.9253 $n$
log $\eta_2$	9.5533 $n$	9.5533 $n$
log (1)	9.5235 $n$	9.4786
(1)	-0.3338	+0.3010
sin $(N \mp \psi)$	9.5540	9.7320
log $\xi$	8.7487	8.7487
log (2)	8.3027	8.4807
(2)	+0.0201	+0.0302
(1) - (2)	-0.3539	+0.2708
log [(1) - (2)]	9.5489 $n$	9.4326
const. log	6.7591	6.7591
log $\tau^2$	2.3452	2.7012
colog $(n \cos \psi)$	0.7486	0.7486
log $\delta\tau$	9.4018 $n$	9.6415
$\delta\tau$	- 0.25 <sup>m</sup>	+ 0.44 <sup>m</sup>
$\tau + \delta\tau$	- 15.13	+ 22.86

$T+t$	Mar. 8 <sup>d</sup> 18 <sup>h</sup> 58 <sup>m</sup> .8	18 <sup>h</sup> 58 <sup>m</sup> .8
Washington Mean Time of Phase,	" 8 18 43.7	19 21.7
$\lambda$	-0 16.6	- 0 16.6
New Haven Mean Time	Mar. 8 19 0.3	19 38.3

To find  $\delta P$  and  $P$ :

$\log \eta_2$	9.5533 <i>n</i>	$\log \xi$	8.7487	(3) - 0.3556
$\sin N$	9.9977	$\cos N$	9.0071	(4) + 0.0057
$\log (3)$	9.5510 <i>n</i>	$\log (4)$	7.7558	(3) + (4) - 0.3499
		Immersion.		Emersion.
$\log [(3) + (4)]$		9.5439 <i>n</i>		9.5439 <i>n</i>
const. log		7.3038 <i>n</i>		7.3038
$\log r^2$		2.3452		2.7012
$\text{colog } \cos \psi$		0.3457		0.3457
$\log \delta P$		9.5386		9.8946 <i>n</i>
$\delta P$		+ 0.3		- 0.8
$N \mp \psi$		21.0		147.4
constant		0.0		180.0
Angle of position: $P$		21.3		326.6

from the north point of the Moon's limb toward the east, for direct image.

Pages 609-610 contain in detail all the data necessary for observing every occultation of the general list which is visible at Washington during the current year.

Page 611 contains the *Ephemeris for Physical Observations of the Sun*.

Pages 612-619 contain the *Ephemeris for Physical Observations of the Moon*. The selenographic longitudes are measured in the plane of the Moon's equator, the axis of reference being the radius of the Moon which passes through the mean center of the visible disk, positive toward the west—i. e., toward Mare Crisium—and the latitudes are measured from the Moon's equator, positive toward the north—i. e., in the hemisphere containing Mare Serenitatis.

The optical and physical librations in longitude and latitude have been computed with elements and formulæ given on page xi, and their sums are given in the second and third columns, respectively, the physical libration being given separately in the fourth and fifth columns. The Sun's selenographic colongitude ( $90^\circ$  - longitude) and latitude and the position-angle of the Moon's axis,  $C$ , in the sixth, seventh, and eighth columns, respectively, have all been corrected for the effect of physical libration.

When the libration in longitude is positive, the mean center of the disk is displaced toward the east—that is, the region thus exposed to view is on the west limb—and when the libration in latitude is positive the mean center of the disk is displaced toward the south—that is, the region thus exposed to view is on the north limb.

The altitude of the Sun,  $A$ , at any given time above the horizon of any point on the Moon whose selenographic longitude and latitude,  $\lambda$  and  $\beta$ , are known, may be computed from the following formula, the Sun's selenographic longitude and latitude being denoted by  $l_\odot$  and  $b_\odot$ , respectively:

$$\sin A = \sin b_\odot \sin \beta + \cos b_\odot \cos \beta \cos (l_\odot - \lambda)$$

Pages 620-621 contain the data with reference to the illuminated disks of Mercury and Venus. The angle  $\theta$  is the angle which the arc of the great circle from the planet to the Sun makes with the arc from the planet toward the west

measured in the direction west, north, east, south. It is measured from  $0^\circ$  to  $360^\circ$ . We may also regard  $\theta$  as expressing the angle which the line of cusps makes with the meridian, the positive direction of the meridian being toward the north, and the positive direction of the line of cusps that in which a person following this line would have the illuminated portion of the disk on his right.

Pages 622–625 contain the *Ephemeris for Physical Observations of Mars*. The quantities here given have been corrected for aberration, so that in using them they should be interpolated to the actual time of observation.

$P$  is the position-angle of the axis of rotation measured eastward from the north point of the disk.

$A_\oplus$  and  $A_\odot$  are the planetocentric right ascensions of the Earth and Sun, respectively, measured in the plane of the planet's equator from its vernal equinox.

$D_\oplus$  and  $D_\odot$  are the planetocentric declinations of the Earth and Sun, respectively, referred to the planet's equator.

$\odot \lambda$  is the planetocentric longitude of the Sun measured in the plane of the planet's orbit from its vernal equinox.

$k$  is the ratio of the area of the illuminated portion of the apparent disk to the area of the entire apparent disk regarded as circular.

$i$  is the angle between the Sun and the Earth as seen from the planet.

$q$  is the angular value of the greatest defect of illumination as seen from the Earth.

$Q$  is the position-angle of the radius of the disk which passes through the point of greatest defect of illumination—that is, of the radius perpendicular to the line joining the cusps. It is measured eastward from the north point of the disk.

The column headed *Central Meridian* contains the longitude of the meridian which bisects the disk, measured from the adopted zero meridian.

The columns headed *Transit of Zero Meridian* contain the Washington Mean Time of every transit of the zero meridian across the actual center of the disk.

Pages 626–629 contain the *Ephemeris for Physical Observations of Jupiter*.

The columns headed *Central Meridian* contain the longitudes of the meridian which bisects the disk, measured from the adopted zero meridian of System I and System II, respectively.

The column headed *Correction for Phase* contains the corrections to be applied to the longitudes of the central meridian to obtain the longitudes of the meridian bisecting the illuminated disk.

The column headed *Transit of Zero Meridian* contains the Washington Mean Time of every fifth transit of the zero meridian across the center of the illuminated disk.

The quantities in the remaining columns on pages 626–627 are the same as those defined under the *Ephemeris for the Physical Observations of Mars*.

Pages 630–655 contain, concerning the *Satellites of Jupiter*, the times of conjunction of Satellites I–IV, the times of elongation of Satellite V, the differences in right ascension and declination between Jupiter and Satellites VI and VII, and the phenomena of the Satellites I–IV together with their configurations.

Page 656 contains the *Magnitude of Saturn* and the *Elements of the Rings*.

Pages 657–663 contain, concerning the *Satellites of Saturn*, the diagram of the orbits of the seven inner satellites, the times of elongation for the first eight



satellites, the differences in right ascension and declination between Saturn and Phœbe, the ninth satellite, and tables for predicting the position-angles and distances from the center of the planet of the first eight satellites.

Page 664 contains the diagram of the orbits of the satellites of Uranus, together with the times of their elongations.

Pages 665–666 contain tables for predicting the position-angles and distances from the center of the planet of the satellites of Uranus and Neptune.

Page 667 contains the diagram of the orbit of the satellite of Neptune, together with the times of its elongations.

Pages 668–669 contain the *Phenomena*. The predicted times of the conjunctions, quadratures, and oppositions of the planets with respect to the Sun are, respectively, the instants when the longitude of each planet differs from that of the Sun by  $0^\circ$ ,  $\pm 90^\circ$ , or  $180^\circ$ . For the conjunction of the planets with the Moon and with each other the predicted times are the instants when the two bodies have the same right ascension. The degrees and minutes to the right show the difference of declination at the moment of conjunction.

Pages 670–679 contain the *Positions of Observatories*. These have been compiled from various sources, and the data used are the best immediately available. The tabular arrangement is self-explanatory.

Page 680 contains two examples in the computation of lunar distances, which are inserted because the lunar distance tables have been omitted from the American Ephemeris since 1911.

Pages 681–699 contain a series of tables numbered from I to VI.

Table I—*For Finding the Latitude by an Observed Altitude of Polaris.*

Table II—*For converting Sidereal into Mean Solar Time.*

Table III—*For converting Mean Solar into Sidereal Time.*

Table IV—*For Finding the Azimuth of Polaris at All Hour Angles.*

Table V—*For Finding the Azimuth of Polaris at Elongation.*

Table VI—*For Finding the Times of Upper and Lower Culmination of Polaris.*

The following-named persons were engaged in the preparation of the American Ephemeris and Nautical Almanac for the year 1915:

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β 295	c <sup>2</sup> 477		11 398	ο <sup>2</sup> 348	38 298	ι 288
γ 303	i <sup>1</sup> 484	Arietis.	33 404		40 298	μ 309
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ι 482	α 449	δ 314	1147 357	β 351	Centauri.	ο 306
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λ 482	γ 448	ζ 315	2777 460	Can. Ven.	α <sup>2</sup> 403	σ 307
μ 294	δ 445	ν 308			β 398	τ 300
ο 476	ε 442	σ 310	Camelop.	α 392	γ 390	υ 302
π 290	ζ 442	τ 315		2 386	δ 385	2 486
σ 288	η 449	41 310	β 329	8 388	ε 396	12 290
υ 298	θ 451		4 327	17 H. 396	ζ 397	13 290
φ 484	κ 446	Aurigæ.	9 328	20 393	η 403	20 293
22 288	λ 442		17 333	Capricorni.	θ 399	67 305
	μ 446	α 331	43 345		ι 394	
Antliæ.	τ 451	β 338	2 H. 317	α <sup>2</sup> 452	λ 382	Chamaeleon
	ω 444	δ 338	5 H. 319	β 452	π 381	
α 373	1 438	ε 329	9 H. 320	γ 464	ρ 391	β 387
θ 368	2 439	ζ 329	19 H. 331	δ 465		δ <sup>2</sup> 376
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Apodis.	Aræ.	ι 328	25 H. 349	ι 462	β 464	π 382
α 404	α 428	λ 332	30 H. 263	μ 466	γ 483	
γ 419	β 427	μ 331	32 H. 391	π 453	ζ 469	Cœli.
δ <sup>1</sup> 417	δ 428	ν 337		ρ 453	η 457	
θ 398	ε <sup>1</sup> 424	ο 336	Cancri.	υ 455	θ 454	α 327
59 (G.) 426	θ 434	χ 334		φ 456	ι 475	
		φ <sup>1</sup> 341	α 362		κ 451	Columbæ.
Aquarii.	Argûs.	φ <sup>2</sup> 345	β 357	Carinæ.	ο 480	
α 467	α 342	51 343	γ 360		π 477	α 336
β 463	β 364	63 348	δ 360	b <sup>1</sup> 363	11 465	ο 332
γ 470	γ 356		ζ 356		20 468	
δ 476	δ 361	Boötis.	η 359	Cassiop.	24 469	Comæ.
ε 457	ε 358	α 400	ι 361		39 H. 275	
η 472	η 375	β 407	κ 363	α 291	41 H. 484	20 387
θ 470	θ 375	γ 403	σ <sup>2</sup> 362	β 287	43 H. 251	24 389
ι 468	ι 365	δ 409	ω 355	γ 294	47 H. 312	31 391
λ 475	λ 364	ε 404	d <sup>1</sup> 358	δ 297	48 H. 314	43 393
μ 457	μ 375	η 397	83 364	ε 301	51 H. 251	
ν 460	ν 344	θ 401		ζ 290	226 B. 472	Cor. Austr.
ξ 464	ξ 354	λ 401	Can. Maj.	η 293		α 443
π 471	π 350	μ 410		ι 306	Ceti.	
σ 471	ρ 356	ν <sup>1</sup> 411	α 345	μ 295		Cor. Bor.
τ 474	σ 352	ρ 402	β 341	ο 292	α 312	
υ 472	τ 346	σ 403	γ 348	ρ 485	β 292	α 412
φ 478	υ 368	τ 396	δ 348	ω 299	γ 309	β 411
ψ 479	φ 370	φ 407	ε 347	4 480	δ 308	ε 415
ω <sup>2</sup> 483	χ 355	c 408	ζ 340	5 H <sup>1</sup> . 478	ζ 301	ζ 412
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			θ 347			



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4 487	$\beta$ 476	Piazz.		$\theta$ 441	$\epsilon$ 486	$\beta$ 384
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